ELECTRICAL REVIEW

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Planned Generation

Rapid Construction Will Not Endanger Efficiency

As a consequence of the urgent need for new generating plant, the question arises as to whether the speed with which its construction must be carried out may not militate against securing the most economical and efficient performance throughout the twenty years' life of such plant. Any doubts on that score, however, appear to be baseless in the light of recent information.

Circumstances have favoured evolutionary development of a generating technique that is eminently suited to conditions prevailing in this country. Interconnection of power stations on a national scale early in the last decade enabled the rapid growth of load in even the smallest areas to be met by large and efficient stations, the newer elements of which were designed to form part of a comprehensive system. By the time war came to damp down the production of further plant, enough modern units had been installed to indicate the lines of future development, the soundness of which was confirmed through experience gained in the war years, including the running of large units at higher load factors.

Steam Pressures and Temperatures

Steam conditions as the outstanding factor in power station design were shown by Mr. F. W. Lawton in his I.M.E.A. paper (our issue of June 27th) to be related to load factor and capacity of generators. At the Mechanicals' centenary celebrations Sir Johnstone Wright gave particulars (referred to on p. 69) of how standardization is being applied to the generating plant programme of the Central Electricity Board with the aim of expediting production without making undue claims upon labour and scarce materials but at the same time securing the highest overall efficiency in operation.

Turbines should offer little difficulty. The lower range of standard steam conditions (600 lb per sq in. and 850 deg F) has for many years been common practice and the larger ratings in the higher range introduced (900 lb and 950 deg) will probably present few new problems apart from hydrogen cooling of alternators.

Boiler-house Practice

It is on the steam-raising side the most notable variations from past practice are to be found, more especially in the greatly extended use of pulverized fuel, the supremacy of which seems likely to be threatened in certain fields only by stokers of the spreader type. Scope is to be allowed, however, for experiment by the installation of non-standard units in a few stations.

Both Sir Johnstone and Mr. Lawton emphasize the importance of the external appearance of new stations, which now reach a functional elegance not attained generally, as far as we have been able to observe, by thermal stations abroad. The particular attention paid in this country to the layout of auxiliary plant has helped here as it has added to efficiency in operation.

A similar trend towards the adoption of 900 lb steam pressure for larger sets on the Continent and in the United States

is apparent from two companion papers presented on the same occasion and, in regard to the latter, from a list of new plant in hand given in the June issue of *Power*. The aid to the rehabilitation of Great Britain that will accrue from what is "probably the largest programme of steam-plant construction ever carried out as a unified whole" would, as Sir Johnstone states, have been impossible without the enterprise and energy which have been shown by the staffs of the electricity supply industry and generating plant manufacturers.

Gradual Recantation

AFTER deciding not to impose a 66⅔ per cent purchase tax upon electric cooking equipment, kettles and irons, the Chancellor of the Exchequer has pondered further and now proposes to remove the tax from wash-boilers and refrigerators, too, and to maintain the tax on washing machines, vacuum cleaners and sewing machines at 33⅓ per cent instead of doubling it. While Mr. Dalton may be thanked for this relief we still think that he might have gone a bit further and relieved water heaters from the tax. These may be heavy current consumers but they use electricity efficiently and in summer time at least are fuel savers. The Finance Bill is not yet finished with and so it is not too late for Mr. Dalton to take another step and relieve the public of unnecessary further burdens.

Unnecessary Extravagance

FROM time to time during the war we commented on the tendency of Government Departments to place undue emphasis upon solidity in equipment supplied to their orders. If we may single out any particular Department it is the Admiralty, whose specifications have always insisted on plenty of metal and other materials. In view of the conditions and situations in which naval gear is used there is a certain amount of justification for ultra cautiousness but most other Departments cannot have this excuse. The continued shortage of materials makes economy imperative and gives a good reason for the Director of the Electrical Contractors' Association (Mr. L. C. Penwill) to ask his members to draw his attention to any insistence by Government Departments and local authorities on the extravagant use of materials. This has already been the subject of a communication to these authorities from the appropriate Government Departments.

Gas-fired Stations

JUST as it costs less to transport coal than to transmit electricity from a colliery to an industrial centre, so it has been found more economical in France to convey gas from distant blast-furnaces to a large riverside power station than to generate electricity in small local plants. In one instance, cited by Dr. A. Meyer in this issue, the gas from five furnaces near Longwy is to be taken three miles in 40 in. diameter pipes at a pressure of 1·3 lb per sq in. with a loss of 0·5 per cent. It is estimated that 1 kWh will require 120 cu ft of 100 B.Th.U. gas, i.e., 12,000 B.Th.U. Means are provided to supplement the gas by coal if necessary.

Plant for Export

UNDER the misleading heading, "No Further Exports of British Generating Plant" the *New Zealand Electrical Journal* quotes a report in a London paper that no further orders for the export of generating equipment must be accepted by British manufacturers without Government approval. The heading is considerably qualified by the last three words. United Kingdom producers are still free to accept export orders but they have been asked first to consult with the Ministry of Supply to ensure that such orders will not absorb capacity needed for carrying out the planned programmes of the Central Electricity Board and the North of Scotland Board.

Paper Still Needed

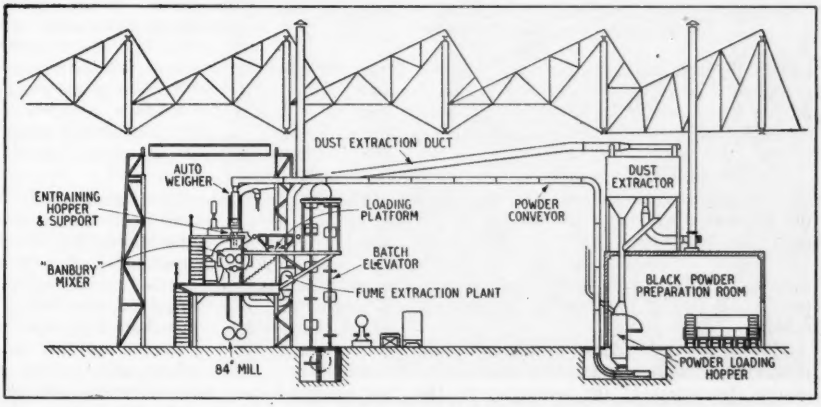
DEMANDS for containers of all kinds (including many types used by the electrical industry) are still growing at a time when there are great difficulties in production. These and other packing materials are for the most part produced from salvaged paper and although the necessity of saving paper has been less stressed since the war ended that necessity is as great as ever. As this is a matter in which everybody is interested everybody should see that waste paper is regularly gathered up and taken by the local authorities or other collecting organizations. Once again we urge the delegation of this duty to specific individuals in factories and commercial establishments.

Modern Rubber Mixing

Continuous-Flow Production

IN the *Electrical Review* of May 23rd we described how the high-voltage distribution system at the Dunlop factory at Speke has been modified and extended to make it suitable for the new production conditions which have resulted from the conversion of the factory from the wartime production of aircraft by Rootes Securities to the peacetime manufacture of such products as automobile and cycle tyres, footwear, golf and tennis balls, and heavy conveyor belting. There is also special electrical interest in the production plant, particularly in view of the continuous straight flow line method which has been adopted—it is believed for the first time in rubber processing and manufacture—and in this article we deal with the electrical applications to the initial mixing and milling processes by which the rubber is prepared as the raw material for the manufacture of the various rubber products. The continuous-flow production principle is particularly evident in the mixing and milling section which represents outstanding examples of the electrical applications to this principle in heavy industry and engineering.

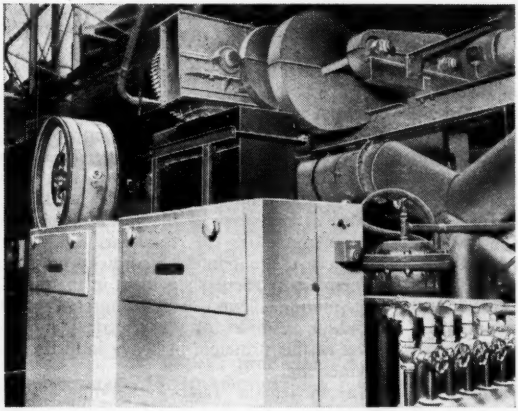
In the main factory building, which



Continuous-flow production principle in operation in the mixing and milling section

measures 1,440 ft long by 600 ft wide, and has building heights of 20 ft, 30 ft and 40 ft from south to north, the heavy plant in question has been installed in the 40 ft section because it requires a minimum head room of 30 ft plus space above for a 15-ton crane.

In this way the production flow throughout the factory is from north to south. The processes are largely initiated by the preparation of the gas and lamp-black powders in a special sealed powder stores at the extreme end of the building, and the prepared powders are conveyed to the tops of the mixing and milling installations some 50 ft or so away to the south. The production-flow direction is then vertically downward through weighing and loading equipments, the mixing plant



Black-powder conveyor delivering into the weighing hoppers at the top working level of the stillage

and finally the mills at floor level. Other ingredients, however, are introduced to each mixing plant proper by a vertical elevator situated near to each mixing and milling plant.

The Bridge-Banbury mixers are mounted on steel and concrete stillages, and with their driving equipment and the elevators and conveyors and other ancillary equipment by which they are served, and with the floor-mounted milling plant under the stillages, the whole is an impressive engineering achievement.

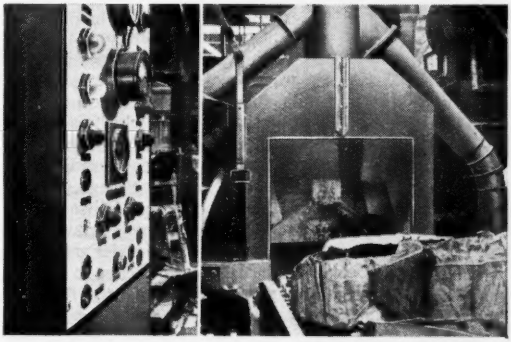
The black-powder conveyor to each plant is specially designed and totally enclosed to ensure cleanliness to the workers and the shop. It is driven by a slip-ring motor which is automatically operated from a central control panel so that the predetermined weight of powder is delivered to the mixing chamber at the right period of the mixing cycle.

During the major part of the conveying operation this conveyor delivers the powder into the weighing hoppers at the top working level of the stillage, at a constant rate until the required powder load is nearly reached, when the speed of delivery is automatically reduced to a " dribble " to ensure the accurate weight of the charge. This dual-speed control is effected by an industrial solenoid operating a clutch which transfers the conveyor drive from the high to the low speed. When the powder in the hopper reaches the required weight the conveyor is automatically stopped and the appropriate light on the control panel indicates that the hopper is fully loaded and ready for discharging into the mixing chamber.

Immediately after the powder has been discharged into the mixing chamber and the loading hopper is empty the controller restarts the powder conveyor and again fills the hopper ready for the next batch requirement. The operator can ascertain the condition of his powder-feeding units by the indicating lights on the control panel which is situated at the feeding-hopper level. If the powder should run low in the loading hopper at the stores end a red light will appear on the operator's panel coincident with the appearance of a similar light at the control panel, thereby attracting the loader's attention to the undesirable loading condition and ensuring continuity of supply of material to the mixing plant.

The batch is completed with specified quantities of the more solid ingredients which are brought to the loading hopper at the working level immediately below that at the weighing equipment. This conveyance is effected first by a vertical elevator close up to the plant, with trays at about 5 ft intervals on to which the ingredients are fed, and secondly by a short endless conveyor belt at the loading-hopper level which transfers the specified amount for the batch from the

loaded elevator tray which has stopped in line with the short conveyor and allows the material to fall into the loading hopper at the other end. Both the elevator and the short conveyor are electrically driven and rubber and the various compounding ingredients are brought together and mixed, and it is from the mixer that the bulk of the rubber compound is supplied to the goods manufacturing sections throughout the factory.

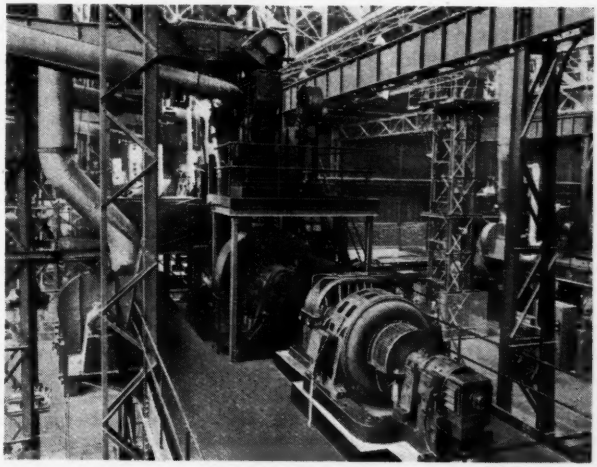


The operation cycle is controlled automatically from a central board situated near the batch conveyor and feeding hopper

their motors are automatically sequence controlled in the operation cycle to be referred to later. To ensure a rapid discharge of the ingredients from the charging hopper to the mixing chamber immediately below, the hopper is automatically agitated by a compressed-air operated vibrator which comes into action with the opening of the discharge door on the hopper.

The automatic charging and mixing control is set in motion when the operator closes a small switch on the central panel. This switch energizes a solenoid-operated air valve by which the upper ram of the mixer is lowered into the neck of the mixing chamber. The mixer is kept running continuously and is loaded in the correct sequence with its full charge weighing between 350 and 500 lb, according to the specification of the compound required. Thus, in the cast-steel chamber of the mixer the raw

The lowering of the top ram of the mixer represents the time of the development of the main load on the mixer driving motor, for not only does the top ram maintain the mixing pressures on the batch within the mixing chamber, but it also acts as a compensator against undue mixing loads which might otherwise damage the plant. The whole cycle of operations is controlled by an industrial timer mounted on the control panel. The pointer of this timer is normally at rest at zero, and the predetermined cycle period is set by the supervisor. When the mixing cycle is completed and the timer returns to zero a relay is energized, which operates the bottom-door air valve and so opens the sliding door in the bottom of the mixing chamber and allows the batch to be discharged through a chute directly into the nip of the 84-inch sheeting mill immediately below at the ground-floor level. Both visible and audible signals are incorporated in the control system, and they



The mixer driving motor is a 500-h.p., 5,000-V synchronous induction equipment

warn the operator at the mill of the pending discharge of the batch.

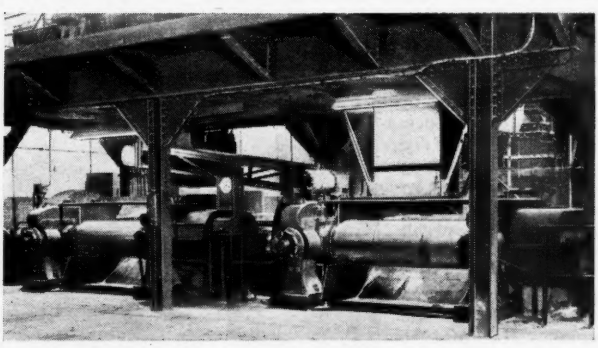
During the mixing operation both the operator and the supervisor are able to observe the loading of the mixer by means of an ammeter located prominently on the control panel. Further, the operation loading of each mixer and each individual batch are under constant observation in the mill control laboratory by means of an indicating kilowatt meter, while a potentiometer pyrometer, also in the laboratory, indicates the internal mixing temperatures in the chamber. The mixer, complete with its driving motor and transmission gear, is mounted on the stillage at about 12 ft above the floor level, and the operating switchgear and starting equipment for the motor are situated at the floor level.

The mixer driving motor is a 500-h.p., 5,000-V synchronous-induction equipment specially built by the General Electric Co., Ltd., to the specification of the Dunlop engineers. It is designed to operate at 0·9 leading power factor with a full-load efficiency of 90 per cent. The overload characteristics are such as to give 100 per cent output for 30 seconds, 50 per cent for 30 minutes and 25 per cent output for two hours. The motor runs at 750 r.p.m., and the power transmission to the rotor shaft of the mixer is by a double helical gearing with a 25 to 1 overall reduction ratio: a flexible inter-coupling is employed in this transmission scheme. The motor is mounted on two pedestal journal bearings, and the excitation unit is directly coupled to the main motor and carried by a single bearing, the whole being mounted on a heavy bedplate.

The switchgear and starting equipment for the mixer motor includes a manually closed, free-handle oil circuit breaker fitted with two overload releases with oil time-lag dashpots and a single-pole direct acting earth-leakage trip coil; an interlocked boiler-plate cubicle unit for the stator-circuit control, the cubicle also housing a fully interlocked combined isolating and "off-load" externally operated reversing switch, together with the usual meters and field regulators; and a fully interlocked three-electrode liquid resistance starter for the regulation of the rotor-circuit current. A large "stop" bush-button switch on the automatic control panel at the operator's station enables the motor to be stopped easily and instantly in the case of emergency.

The simplest milling operation involves the passage of the batch many times between the heavy water-cooled rolls of the 84-in. sheeting mill, and for this operation alone a single-mill unit is required which is driven by a 125-h.p. motor. Often, however, it is desirable to introduce further ingredients in small quantities at the milling stage, so that the operation then becomes partially a mixing one, and in consequence more power for driving is required for the heavier duty. In this case it is the customary practice to employ a two-mill unit, with a 300-h.p. drive for each mill.

Both the 125-h.p. and the 300-h.p. mill motors are G.E.C. synchronous induction machines, the special characteristics of which include heavier overloads, a 0·9 leading power factor with correction facilities, and separate excitation with dynamic braking.



It is usual to employ a two-mill unit where further ingredients are introduced at the milling stage

Each motor has a speed of 375 r.p.m., and the transmission to the mill lineshaft is taken through a totally enclosed double helical reducing gear of about 7 to 1 ratio. The main switchgear for the mill motors is of the air-break contactor type and is totally enclosed in a steel cubicle together with separate starting and breaking resistances. Special ironclad totally enclosed weight-operated trip switches with trigger latch releases and hand re-set mechanism are coupled to a trip-wire system running in

front of the mill, and an extremely light pull on this trip wire immediately stops the motor and brings the dynamic braking into operation. By this braking system the whole installation can be brought to rest within 3½ revolutions of the motor shaft. When the batch of mixed and sheeted rubber is ready for removal from the mill it is cut from the front roll by means of special knives and fed as a continuous strip on to a cooling and chalking conveyor from which it is cut into slabs and stored ready for the succeeding processes.

Equipment ancillary to the major installation includes a very effective dust-extraction system which collects all the powders which escape at the mixer hood and transfers them back to the dust-extraction and separating plant surmounting the sealed powder stores. The reclaimed powder is separated from the extracted air and deposited back into the main powder conveyor system, the cleaned air being discharged to the atmosphere. Two 15-ton overhead electric cranes with long and traverse travels are so disposed above the plant that each crane can serve at least four of the mixing and milling plants for maintenance purposes.

We are indebted to the Dunlop Rubber Co., Ltd., for permission to visit the factory and to publish this article, and to Mr. D. Crabbe, chief engineer, and his staff for their co-operation.

Each single mill is driven by a 125-h.p. synchronous motor, and transmission is via a double helical gearing

Huddersfield Extensions

ON Friday last a second 20,000-kW, 3,000-r.p.m. turbo-alternator was started up at St. Andrew's Road generating station by the Mayor of Huddersfield (Alderman T. Smailes) raising the total capacity to 60,000 kW. Steam at 380 lb per sq in. and 750 deg F is raised in two tri-drum boilers, each with a maximum continuous rating of 120,000 lb per hr. Firing is by chain-grate compartment stokers. A reinforced-concrete tower (250 ft high, 165 ft diameter at base), has a capacity of 2,600,000 gal per hr.

The overall efficiencies, economical and maximum continuous ratings, per cent (guaranteed), are:—Boiler plant, 82·3 and 81·0; turbo-alternator, 31·1 and 30·1; alternator at 0·8 power factor, 96·26 and 96·68. Steam consumption of turbo-alternator, lb per kWh, 9·618 and 10·097. Calculated thermal efficiencies of the complete plant are 24·15 and 23·35 per cent. As part of the present extension a 33-kV ring-main system has been introduced. About seven miles of 33-kV cable has been laid to two substations of 15,000- and 10,000-kVA capacity. The work was carried out to the instructions of Mr. F. A. Ellis, the borough electrical engineer.

Manufacturers of plant components include:—Stirling Boiler Co., boilers, superheaters and ash extractors; Babcock & Wilcox, stokers, economizer sootblowers and coal conveyors; Davidson & Co., fans; James Howden, regenerative rotary air heater; Hopkinsons, boiler mountings, valves and gauges; Versil, heat insulation; Aiton & Co., steam and water pipes and triple-effect evaporator; English Electric Co., turbo-alternator, condenser, air and oil coolers and feed heaters; Sharples Centrifuges, oil separator; Newalls Insulation Co., heat insulators; Drysdale & Co., circulating-water and extraction pumps; Mirrlees Watson, air ejectors; G. & J. Weir, electric and steam-turbo feed pumps; Davenport Engineering Co., cooling tower; Wallace & Tiernan, chlorine intermittent-injection plant; Metropolitan-Vickers, auxiliary switchgear and i.d. and f.d. fan motors; Brook Motors, motors; Blakeborough & Sons, c.w. valves.

Views on the News

Reflections on Current Topics

AS I anticipated, electrical retailers are having much difficulty with customers who purchased electric cooking equipment, kettles, irons, etc., between Budget Day and the announcement by Mr. Dalton that he had decided not to impose purchase tax on these appliances. Many customers have lost their bills; others are endeavouring to secure the return of tax on appliances not affected by the decision; and some are unscrupulous enough to try to obtain refunds on equipment bought before Budget Day and never taxed. The Chancellor's latest decision will keep the game going merrily, and bring more retailers' imprecations upon his head.

And yet it has been said there is more joy in Heaven over one sinner that repenteth . . .

* * *

The Editors have passed to me for comment a suggestion from a correspondent that electricity charges should be related to income tax. Surely two-part tariffs already do this, presuming the premises which the consumer occupies are in accordance with his income, which is frequently the case. The fixed charge is based either on floor area or rateable value, i.e., according to the size and situation of the house, often irrespective of the connected load or demand which is erroneously presumed to go up in proportion. To directly associate prices with income would have some strange effects. For instance, many incomes fluctuate a good deal, although the correspondent seems to think that this could be got over by the application of a simple formula. By the way, he calls this a "commonsense naturally uniform tariff." I think that it would be a queer sort of uniformity. Taxation is already being used as a means of "levelling" real incomes; it would be extremely unfair to charge more for electricity (and why not everything else?) on such a basis as is suggested.

* * *

I am rather mystified by the bother the Faversham Town Council is said to be having over the electrical equipment in prefabricated houses. It was stated at a meeting of the Council that, when the equipment, which was under a six months' guarantee, proved defective, a report was sent to the Ministry of Health: the Council was then referred to the Ministry of Works and finally to the British Electrical Development Association, which, it was stated, was unable to give the names of the suppliers. This very much surprises me because every piece of apparatus in the type of house erected in Faversham is supposed to have a code number and Information Bulletins listing these code numbers have been sent out by E.D.A. to all undertakings. If E.D.A. was asked to identify it could and would quickly do so. It can only be that for some obscure reason the code number was missing from a particular batch of apparatus.

* * *

While I realize the hardship caused by electricity cuts, I do not agree with the views expressed in a letter published recently in a provincial newspaper. The writers want to know "why it is that the electricity company is now busy taking electric power out to the village of —— to connect a great number of cottages and people who have never had electricity before—and many of whom have never asked for it?" They went on to say: "It seems crazy to us. Either there is no shortage and we ought not to be made to suffer through all these economies, or else they ought to be stopped connecting all these new users—none of them essential." I wonder whether the writers would like to change places with the villagers (minus electricity)? More important, however, is the fact that, basically, increased food production is our primary need, and if the agricultural industry is to be developed rural life must be made more attractive.

* * *

Another era in radio development dawns with the announcement from Johannesburg that a research worker there claims to have invented a set which receives music only, automatically tuning to another station as soon as it "hears" some one talking for more than a minute. Presumably it will not be long now before further refinements will enable the set to select only the types of musical or other programme we like best. In the future we shall no longer switch on to long, medium or short waves but high-, medium- or low-brow programmes.

—REFLECTOR.

Staffing and Management—I

Present Position in the Electricity Supply Industry

By G. O. McLean, *M.Eng.*

IT may seem anachronistic in days of labour shortage and after the Barlow Committee has recommended doubling the output of graduates from the universities to meet the country's needs, for anyone to write about the selection of staff. The contrary view, however, is surely the correct one: because there is a shortage, the selection must be more carefully performed. Each job must be filled by the right man to secure the maximum of efficiency in the industry. The author's experience of present-day methods may be worth recording, so that some thought can be given to personnel policy for the future integrated supply industry.

Mr. McLean has had long experience in all sections of municipal and company undertakings and is Establishment Officer in the Edmundsons group with 12,600 employees

Only two functions are mentioned in the title, and it should be made clear that management involves more than the mere handling or allocating of the staff. Other functions carried out by an establishment office and sometimes by separate sections of that office, are the provision of services for the staff, such as office equipment, cleaning and maintenance of premises, down to the provision of uniforms and overalls for those who need them; recording of activities, from the movements of individuals to the issue of bulletins or a staff magazine; liaison with trade unions and Government Departments; and, finally, research, such as the trying out of different methods.

Recruitment and Selection

Selection covers the whole of the personnel in an undertaking, from the chief executive officers down to the manual workers. The method of selection and the body responsible for selection naturally varies at present from the personal interview by a board of directors or appointments committee down to the few words of casual appraisal given by a foreman to a labour recruit. Whoever the interviewer may be and whatever his methods, he has to form a judgment on at least one characteristic, namely, the candidate's ability to do the job.

Recruitment is at present greatly helped by the setting up of appointments offices and appointments boards and bureaux by professional institutions and ex-Service organizations, and there are still the established methods of school and university appointments boards, public advertisement, and, despite its inherent dangers, private recommendation.

Recruitment, of course, begins with an analysis of the jobs to be filled. The knowledge of the jobs should not rest solely on an official analysis drawn up by a foreman or head of a section, valuable as this may be, but the knowledge should be gained first-hand by the officer concerned from experience in each section. At the same time, the establishment officer is familiar with the employment policy of the undertaking concerned, where the term "employment policy" includes not only wage rates and the status of the job in comparison with other sections, but also such items as promotion policy, acceptance and treatment of alien applicants, which sex is favoured for any particular section, and also whether or not politics is an important factor.

Application Forms

The first stage in selection is the completion by the applicant of an appropriate form—the simpler the better from both the employer's and the candidate's points of view. Often the first impression of a firm or undertaking is received through an application form arriving by post. Though the application form, in the majority of cases, is used as the basis for all records and space is therefore reserved on it for use by the establishment office, such as the recording of interview date, the decision of interviewer, commencing date and salary if appointment is offered, the author suggests that this section of the form should be kept as blank as possible. The form itself should be concerned with the basic facts regarding the applicant—name, address, age, education and previous experience—while other factors, such as salaries received and reasons for changes of occupation, should be left until the personal interview stage.

This stage depends on the number and abilities of those carrying out the interview. If a large committee or board is responsible

for selecting staff, it is probable that the questions candidates are asked are fairly stereotyped and merely produce answers amplifying the outline of experience given in the application form. For instance, in municipal undertakings councillors seem to attach great importance to the size of undertaking with which previous experience was gained, and ask questions about the number of consumers, the area served, the number of showrooms, or, where there are one or two technical members, the maximum demand, number of staff controlled, and possibly gross and net revenue. This type of questioning, except for checking veracity, gives no guide to the candidate's general abilities and personality.

As a contrast to this procedure, the experienced establishment officer, when interviewing alone or with one or two specialist colleagues, adopts an entirely different technique. Having endeavoured to make the applicant entirely at ease, seeing that he is comfortably seated and perhaps offered a smoke, he induces the man to talk freely, not by asking direct questions calling for factual answers, but by leading from one topic of conversation to another, opening gambits being perhaps test matches, cup ties, railway travel, or even the vagaries of the English climate. Without the use of stereotyped questions he endeavours to assess the candidate on some seven specific headings, or "interview pointers."

Ability to Fit In

The author makes notes regarding each characteristic. For his own guidance he has called these—*Acceptability*, by which is meant the candidate's ability to fit in with existing staff above and below him, and the assessment is made on the candidate's ability to converse easily, his general cleanliness and appearance, and whether he appears to be a sociable being or a decided introvert.

The second point which is assessed in ordinary course of conversation, relates to the man's *interests*. Endeavour is made to find out what these are, how they were acquired, how deep they go, whether they are complementary to the vacancy to be filled, or whether they are likely to distract attention from the job, whether there are too many conflicting interests or whether there have been frequent changes of interest in the past. A third pointer, for want of a better title, has been called "*effective intelligence*," and covers the man's general knowledge, his confidence in himself and his abilities, the mastery he has over the subjects in which he professes to be proficient, and his mental agility.

Another important characteristic, and one rather difficult to assess, is the man's *initiative and energy*. Some guidance on this point may be obtained from the way the man reacts to a difference of opinion and quick questioning. If the interviewer deliberately contradicts something the candidate has said or makes a deliberate mistake in one of his own statements, it will be found that the live man will take it up and hold his own in the ensuing argument.

Another characteristic somewhat akin to "acceptability" and yet following almost directly from initiative and energy, is that of "*co-operativeness*." The interviewer should endeavour to assess the man's ability to carry responsibility, be patient with his subordinates or the mistakes of others which affect his work, and be amenable to authority if this is reasonably exercised.

Technical Qualifications

Almost last in the assessments to be made, but varying in importance with the vacancy to be filled, is the question of *technical ability*. Generally the candidate will have some qualifications which will indicate to the interviewer what some other examiners have thought of the candidate's technical ability, but it is useful to check this point by a few discreet questions or by asking the head of the department in which the vacancy occurs to be present at the interview and ask a few technical questions.

Last amongst the pointers used by the author, is the important aspect of "*motive*." Though the candidate may have been given full marks on all the other points and be a peg of the correct shape and size to fill the vacant hole, his appointment will be a failure if his motives are wrong.

It is probable that the majority of office staff have not undergone previous tests for technical ability, and it is useful, therefore, to give all such recruits a battery of tests to determine intelligence, accuracy and punctuation. The National Institute of Industrial Psychology uses such tests in its vocational guidance work, and also trains or instructs personnel department staff in the use of such tests.

The author has found a battery of tests covering number and name checking, completing sentences, word meanings,

number series, punctuation, absurdity questions and, where applicable, practical shorthand and typing tests, to be of great use. The whole battery of tests only occupies 40 to 45 minutes and, as already indicated, does give the experienced interviewer a guide to the assessment of the pointers labelled above, effective intelligence and technical ability.

A word of warning becomes necessary here, as a great deal more is involved than merely asking the candidate to answer, verbally or in writing, a few set questions and awarding marks according to the correctness of the answers. A test score by itself is valueless. The users must know what the score means, what each element in the battery is attempting to measure, how well it measures it, and what is the normal standard to expect. This standard can be based on the results obtained from existing staff with the same tests, or by correlating the expected outcome based on previous test results with the actual success or failure of the candidate in practice.

Staff management is a subject about which many books have been written, and therefore a mere outline of one's own practice is all that can be attempted here, but at the outset the author would like to stress the viewpoint that management of staff differs little, if at all, from management of anything else.

Adequate Records Essential

Just as scientific treatment of any problem depends on knowledge, which itself is gained from analysis and measurement, so successful staff management depends on the adequacy and accuracy of the records that are kept. Reference has already been made to the application form and whereas this, with or without a separate form detailing the impressions received, assessment made, or additional information obtained at an interview, will be the initial document(s) in the dossier of each individual member of the staff, other essential records are:—(*a*) Conditions of appointment and (*b*) a quick reference card containing all details of the individual's education, qualifications, and history since appointment. This history covers changes in status, salary, absences due to sickness or other causes when these exceed a reasonable period. Space is provided on the card for a note about reasons for leaving, so that accurate information can be passed on to future employers.

Turning now from individual records to group records, many of the items which are recorded individually are collected daily, weekly, monthly, and annually to ensure successful management. Absences due to sickness are an example where the collection of the pieces may indicate a seasonal variation or lead to the discovery of some obscure cause for absences. Obviously, the time lost due to sickness must be related to the number employed. The same is true of the most important collective staff item—*turnover*. However simple the work may have been made due to systems used, mechanization, or co-operative spirit amongst the workers, whether in works or office, training newcomers to take the place of those who have left is always expensive. A moderate figure nowadays for labour turnover is 12 per cent.

Analysis of Labour Turnover

All resignations, dismissals and other departures are carefully analysed, and an attempt made to ascertain the true reasons, which can then be classified as avoidable or otherwise. If dissatisfaction has been expressed, further sub-division of reasons can be attempted, such as money, work conditions (health, fatigue, noise, canteen), attractions of the "other" job, unsatisfactory supervision, or even (a fault of the establishment office itself) being wrongly "placed."

If space permitted, many more paragraphs could be written of records regarding lost time through bad time-keeping or deliberate absenteeism, or, again, on the subject of holiday arrangements and the other functions of management already briefly referred to, but the outline of present practice must suffice as introduction to an expression of views on future policy which is to be the subject of a further article.

Rubber Production and Consumption

ACCORDING to the "Rubber Statistical Bulletin" (London Rubber Secretariat) the estimated production of natural rubber in the first quarter of the current year was 305,000 tons, the consumption 257,500 tons and calculated stocks at the end of March 932,500 tons. Synthetic rubber production in the same period amounted to 195,000 tons and consumption to 190,000 tons, the calculated stocks at the end of the period being 145,000 tons. The total consumption by the British cable industry during the three months is given as 2,234 tons (2,105 tons of natural and 129 tons of synthetic). The Bulletin is obtainable at 2s. from W. H. Smith & Son's branches.

NEW BOOKS

Mathematics and Electrical Theory.

Modern Electrical Engineering Mathematics.—By S. Austen Stigant, M.I.E.E. Pp. 372; figs. 116; index. Hutchinson's Scientific & Technical Publications, 47, Princes Gate, London, S.W.7. Price 31s. 6d.

The author describes his book as " an introduction to the mathematical methods more recently employed in electrical engineering theory, with special reference to stationary linear networks." But, as he says, this book is not introductory in the sense that it is elementary. A list of the titles of the section headings soon demonstrates this: Matrices, Dyadics, Tensors, for example, are subjects which obviously cannot be developed in the early part of a mathematical training.

Thus in one sense the scope of the book is most ambitious in its comprehensiveness. After the usual account of Plane Vector Operators, there is a chapter on Determinants, then the three above-mentioned subjects, a big section on Tensor Concepts in Electrical Engineering Theory, the Mechanism of Tensor Equations and Three-Phase Mesh Network Transformation Tensors, a survey of Symmetrical Components, a brisk account of the Heaviside Operational Calculus, some Dimensional Analysis, the Per-Unit Method, and finally an investigation by means of Heaviside and tensors of the Steady State and Transient Responses of a Static Network to Excitation and another chapter on Transient Phenomena in Switching Parallel-Connected Capacitors.

This, it will be evident, is a huge field to attempt to cover, even in 370 odd pages. One wonders, therefore, what sort of impression of vector operators, determinants and matrices, to take a sample, will be obtained by a beginner from these potted surveys. He will be profoundly struck by their power, that is certain, especially as the author's approach is essentially a practical one in that he immediately applies the technique he has just introduced to an actual problem.

But as regards a real understanding of the method, even considered only as a technique or of its relation to the next technique, that is too much to expect from such a compressed volume; and reading the treatment of " j ", symmetrical components and the Heaviside Calculus, for example, one cannot help hankering after the unforced, elegant and considerably profounder treatment of say, A. G. Warren's " Mathematics Applied to Electrical Engineering," though, of course, the ground covered here is less pretentious as well as less practical.

On the other hand, the author undoubtedly succeeds in rousing the interest of those prepared to acquiesce in the ever-increasing importance of mathematics in electrical engineering. That this is his foremost aim is evident from the extremely handsome bibliography which he supplies with each chapter. With this stimulus the student can then set out on the deeper investigation of any particular subject, forearmed with this evidence from Mr. Stigant of the important problems he will be equipping himself to tackle.—F.G.G.A.M.

Principles of Electronic Equipment.

Electronics in Industry. By George M. Chute. Pp. 461; figs. and index. McGraw Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 25s.

Just as the conclusion of the 1914-18 war witnessed the phenomenal extension of electronic methods and apparatus for radio-communication, so the end of the second world war has led to the widespread application of those methods in heavy engineering. Although this development had begun about ten years before the outbreak of hostilities, its decisive contribution towards victory endorsed its importance, and to-day there are a large and increasing number of electronic equipments in service. The book under review has been written primarily for the benefit of the users and operators of such plant, to enable them to understand the principles of existing designs. It may be said at once that the author has amply succeeded in his aim.

In catering for the needs of electricians rather than engineers, he has proceeded on the assumption that his readers have no previous knowledge of valves and electron tubes generally, and he has given this information gradually and informally. Although the inclusion of so much elementary matter may be somewhat irritating to a small minority of readers, the author's method is well justified. He is evidently an enthusiast, and has made full use of his teaching experience. His diagrams are well thought out and clear, and his examples and analogies are apt.

Notwithstanding the fundamental treatment, a surprising amount of technical information, much of it of an advanced nature, has been included. Special mention may be made of Chapters 19, 20 and 28, on High Frequencies and Shorter Wavelengths, Inverters and Oscillators, and Non-electronic Devices respectively, from this point of view, the last including amplidyne generators, saturable reactors and peaking transformers.

The whole subject is effectively sectionalized, making the book well suited for reference, and there is a fairly extensive index, which might with advantage be amplified at the next printing. Errors are unusually few for a first edition. Many electrical people who are beyond the class of reader for whom the author has modestly announced his work will find it interesting and useful.—W.W.

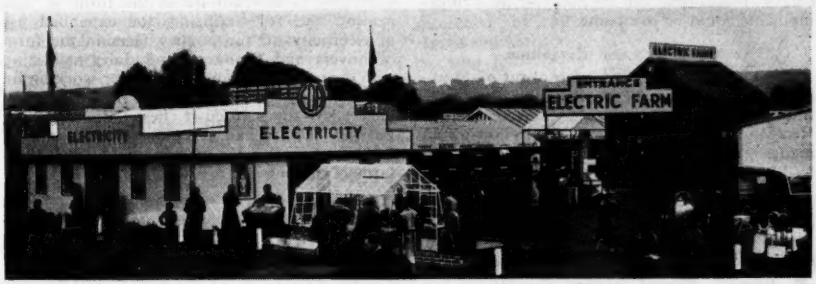
Electricity in Farming

Uses Demonstrated at Agricultural Shows

AN outstanding exhibit at the Royal Show which was held at Lincoln last week was the E.D.A. Electric Farm demonstrating that every farm operation involving light, heat, motive power or refrigeration can be aided and improved by the application of electricity. The farm was divided into a number of sections including dairy and milking equipment, barn and farmyard machinery, poultry breeding appliances, pump equipment, farm workshop, horticulture and greenhouse equipment, and domestic electrical equipment for the farmer's wife. The principal exhibitors at the Electric Farm included Beresford, Sigmund, Stuart-Turner (pumps), Cope & Cope, Curfew Appliances, Horace Stephens, Western Incubators (poultry equipment), General Electric Co., Ltd. (steam raiser and soil warming equipment), Gascoigne, Perkins and Aidas (dairy equipment).

The Electrical Research Association indicated its investigations into the drying of hay, grain, hops, seeds and other crops, dairy sterilization, barn and field machinery, soil warming, soil sterilizing and pest destruction. Attention was also drawn to wind-power generating plant.

The G.E.C. storage steam raiser is specially designed for dairy farms and other situations where steam is required at infrequent intervals with a minimum consumption of electricity. Other dairy sterilizing plant, low-voltage electric soil warming equipment and a grain dryer heater battery were other exhibits.



E.D.A. Electric Farm display at the Royal Show

Among other exhibits at the Show was the latest type of lighting set, made in three sizes of 1·5 kW at 32 V and 2 kW and 4 kW at 110 V, by Associated British Oil Engines, Ltd.

R. A. Lister & Co., Ltd., exhibited the "Todd" insecticidal fog applicator (" Tifa "), as well as petrol and Diesel engines, generating plants, pumps, etc.

Section of agricultural display of the electrical stand at the Royal Norfolk Centenary Show

Royal Norfolk Show

At the Royal Norfolk Agricultural Association's Centenary Show in Keswick Park, near Norwich, on June 25th and 26th, the East Anglian Electric Supply Co., Ltd. and the Norwich and Great Yarmouth Electricity Departments produced a very effective electrical exhibit. In one of four large marquees could be found industrial cooking equipment suitable for hotel kitchens, restaurants, holiday camps,

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canteens and bakeries, while a complete stainless steel cafeteria service counter was in full use providing meals for the staff. In the same marquee was a central advisory and inquiry stand, and a full range of domestic appliances included refrigerators, modern streamlined cookers and " automatic home laundries."

In the agricultural section, market gardeners were especially interested in the latest methods of soil warming and water pumping. Refrigerated service cabinets and cold stores also came in for a good deal of attention. Continuous demonstrations of electric welding showed how delays resulting from breakages at critical moments could be overcome.

Minehead Farm Exhibition

The Minehead Electric Supply Co., Ltd., recently held a four-day exhibition under the title of " Electricity on the Farm " at the Recreation Ground, Minehead. Following an inaugural luncheon the exhibition was opened by Lord St. Audries. The co-operation of local agricultural engineers and merchants increased the agricultural flavour of the show. In the principal marquee the electrical exhibits were displayed to the best advantage, and in the others there were a dairy display; a Food Advice Centre sponsored by the Ministry of Food working in conjunction with the supply company's Cookery Demonstration Department under Miss Monk, senior demonstrator; sound film shows on modern farming, clean milk production, etc.; and a display of model modern kitchens by E.D.A.

Three stands demonstrated application of electricity to horticulture in the form of soil heating and soil sterilizing, the expanded use of electricity on the poultry farm in the form of hovers and brooders, and dairy sterilizing with a recently introduced sterilizer working on a heat-storage principle and having a loading of only 1 kW for a 16 cu ft chest. The National Farmers' Union had a stand mainly concerned with the help the Union is prepared to give to farmers in connection with electricity supply.

North of Scotland Board's Report

THE North of Scotland Hydro-Electric Board's annual report for 1946 just published states that the hydro-electric constructional and electricity distribution scheme programme has made good headway despite difficulties caused by shortages of materials and manpower. Eight generation projects had been approved and seventeen distribution schemes, designed to benefit over 100,000 people in the Highlands, had been prepared by the Board by the end of 1946. Hydro-electric projects under construction were already giving employment to over 4,000 British workers by the end of the year. Camp accommodation for 2,200 men had been provided on the sites of the Board's schemes where ultimately between 10,000 and 15,000 men will be housed.

Major contracts for engineering works have been placed with seventy-three firms and hydro-electric generating plant ordered by the end of 1946 totalled 374,000 kW and consisted of twenty-one units. In addition, the Board has placed orders for fifty-six Diesel generating sets totalling 17,500 kW to operate distribution schemes already approved for remote areas or to provide power for constructional purposes.

The report details the progress of the hydro-electric schemes at Loch Sloy, Morar, Lochalsh, Tummel-Garry, Fannich, Gairloch, Glen Affric and Cowal. When completed, these schemes will have a total average annual output of 720 million kWh.

Tracing the growth of the distribution network in the Islands and Western Highlands, the report points out that the shortage of materials, particularly wood poles, has delayed the erection of overhead lines and cables in the areas of the Lochalsh, Morar, Bute and South Cowal, Orkney and Skye distribution schemes but a start has been made with the supply of electricity in Orkney, Lochalsh, Skye and Mallaig. Nine distribution schemes, under construction or approved, will serve Lochalsh, Morar, Gairloch and Aultbea, Bute, South Cowal, Great Cumbrae, North Cowal, Orkney, Skye, Lochcarron and Arran. During the year eight further schemes were submitted to the Electricity Commissioners for approval to cover the districts of Ullapool and Lochinver, and the islands of Islay, Lewis, North and South Uist, Shetland, Harris and Barra.

Six schemes, the preparation of which has been completed, will bring electricity to new areas—Lochaber, Mull and Iona, Seil, Luing and Easdale, North Sutherland, Ardnamurchan and Little Loch Broom. Schemes are also in preparation for the distribution of electricity in Glenelg, Applecross, Orkney (outer Isles) Coll and Tiree and Caithness.

During the year negotiations were commenced with the Dumbarton County Council for the transfer to the Board of distribution powers in the parishes of Arrochar, Luss and Kilmarnock, and with the Stornoway Electric Supply Co., Ltd., for the transfer of their assets to the Board.

The scale of charges for supplies of electricity to ordinary consumers are as follows: 6d. per kWh for lighting and 1d. and ¾d. per kWh for cooking and heating for electricity generated by Diesel plant, and 5d. ¾d. and ½d. for electricity generated by hydro-electric plant. Hire-purchase facilities covering electrical equipment and the internal wiring are being provided. The capital expenditure was £1,796,204.

Illustrations of the Board's works and their background are a feature of the report, copies of which are available (price 1s. 6d.) through any bookseller.

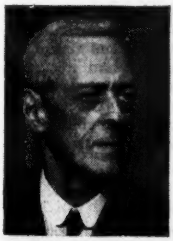
PERSONAL and SOCIAL

News of Men and Women of the Industry

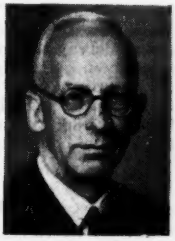
AFTER ten years as lecturer in electrical engineering at King's College, Newcastle-on-Tyne, **Dr. Emrys Williams,** B.Eng., Ph.D. (Liverpool), has been appointed Professor of Electrical Engineering at University College of North Wales, Bangor. A native of Liverpool, Dr. Williams, who is thirty-seven years old, was formerly in the research laboratory of the General Electric Co., Ltd., at Wembley, and is the 1946-47 chairman of the Radio and Measurements Group of the North Eastern Centre of the Institution of Electrical Engineers.

Mr. C. Anderson, A.M.I.E.E., at present engineer in charge of construction, Government Electricity Undertakings, Nigeria, has been appointed borough electrical engineer of Douglas, Isle of Man, in succession to **Mr. Bertram Kelly,** M.I.Mech.E., A.M.I.E.E., on his retirement. Mr. Anderson was chief assistant engineer in the Douglas undertaking at the outbreak of war, during which he served with the R.A.O.C. and the R.E.M.E. being demobilized as lieutenant-colonel.

Mr. F. W. M. Anderson, general manager of W.T. Henley's Telegraph Works Co., Ltd., who as reported in our last issue has been appointed a director of the company as from July 1st, joined Henley's in 1906, having served previously with the National Telephone Co. He occupied the position of assistant sales manager for a



Mr. F. W. M. Anderson



Mr. A. H. M. Jacob

number of years and in 1925 was appointed sales manager. In 1937 he became assistant general manager and in 1943 succeeded Mr. W. F. Bishop as general manager. Mr. Anderson is a director of Oakley Brothers, Ltd.

Mr. A. H. M. Jacob, secretary of Henley's, who has also been appointed a director, commenced with the company in 1906. In 1913 he became an assistant to the secretary, the late Mr. A. E. Salmon whom in 1926 he succeeded as secretary. Mr. Jacob is also a director of Oakley Bros., and of the Antrim Electricity Supply Co. and Antrim Electricity Distribution Co.

We should like to congratulate **Mr. C. W. Sully,** director of the Electric Lamp Manufacturers' Association from 1922 to 1940, on his golden wedding anniversary, which he celebrates on Monday.

Mr. E. Thornley, manager of W. T. Henley's Telegraph Works Co.'s Birmingham branch, has retired after thirty-five years' service. He is succeeded by **Mr. F. C. Horsford,** Associate I.E.E., who joined the company in 1911. Mr. Horsford was appointed engineering sales representative for the London area in 1922, and engineering sales superintendent in 1942.

Mr. F. C. Horsford

During the stormy weather in February last, **Mr. A. W. Turner,** fitter's mate, Harrogate, accompanied **Mr. N. E. R. Wilkinson,** assistant mains engineer, on a routine inspection of an unattended substation at Knaresborough. As they entered, an explosion took place, setting oil on fire. At personal risk Mr. Turner put out the flames, thus preventing serious damage to the switchgear. For his action Mr. Turner has been graciously commended by His Majesty the King in the *London Gazette* and it is understood that Mr. Wilkinson will receive a letter of appreciation from the Minister of Fuel and Power. The Harrogate Corporation has made a presentation of inscribed silver cigarette cases and the insurance company concerned has showed its appreciation in the form of cheques.

Mr. H. Nimmo, M.Inst.C.E., M.I.E.E., M.I.Mech.E., Electricity Commissioner, has accepted the invitation of the Executive Council of the Association of Supervising Electrical Engineers to continue as president of the Association for a second year. Mr. Nimmo will deliver his address at the opening meeting of the Association's London session on October 14th at the Lighting Service Bureau, W.C.2.

After fifty-six years' association with the *Electrical Times* **Mr. R. W. Hughman** retired at the end of last month. Mr. Hughman was with Robert Hammond when, in 1891, he started the journal *Lightning*; he was secretary and "general utility man," becoming assistant editor in 1895 and general manager in 1901, when he changed the title of the paper to its present style. He was appointed joint managing director in 1907 and was managing director at the time of his retirement. For many years he worked in close

harmony with the late Mr. Ernest Slater (editor from 1906 until his death in 1942).

Mr. Hughman's many friends in the electrical industry will join with us in wishing him many happy years of rest after his long and very active service.

Mr. S. R. B. Swan, of Wakefield, who has been appointed principal of Accrington Secondary Technical School, is a M.Eng. of Liverpool University. He is a member of the Institutions of Electrical and Mechanical Engineers.

Mr. G. F. Cole, who for the past year has acted as assistant secretary of the Illuminating Engineering Society has now been appointed secretary. Before the war Mr. Cole held an appointment with the Ministry of Transport but relinquished this to take up a commission in the Territorial Army.

Lady Railing presenting the Beauty Competition prize to Miss Joan Lavender at the recent G.E.C. sports meeting at Wembley

The National Coal Board (Scottish Division) announces the appointment of **Mr. G. H. Rowbottom,** B.Sc., as divisional chief electrical engineer. Mr. Rowbottom has been executive engineer to the Clyde Valley Electrical Power Co. and its associated company, the Lanarkshire Hydro Electric Power Co., since 1927.

Mr. T. A. Atkinson, managing director of Dynamo & Motor Repairs, Ltd., tells us that he is not related to Mr. T. Atkinson the manager of the new Penryn branch of the Industrial Electric Co. (*Electrical Review*, June 20th) who served his apprenticeship with Dynamo & Motor Repairs.

Mr. Maurice Bulpitt and **Mr. Francis Bulpitt** have been elected to the board of Bulpitt & Sons, Ltd. They both joined the company immediately after leaving school and have been actively associated with its management for nearly twenty years.

Mr. T. R. Murphy, present site resident engineer with International Combustion, Ltd., has been appointed maintenance engineer at the Blackburn Meadows generation station of the Sheffield Corporation.

Formerly manager of Berwick branch of the Southern Scottish Electric Supply Co., **Mr. David Hebenton,** was recently presented with a cheque by Mr. J. R. Sankey, manager of the company, on behalf of the staff, on his retirement.

Mr. C. C. Scott managing director of Flinders (Wholesale), Ltd., has been elected a director of the parent company, Electrical Components, Ltd. **Mr. H. Lyon,** manager of the Norwich branch of Flinders (Wholesale), Ltd., has been appointed a director of that company.

We have been asked by **Mr. J. Entwistle,** A.M.I.E.E., sales director of the Mersey Cable Works, Ltd., a subsidiary company with the Simplex Electric Co., Ltd., of Tube Investments, Ltd., to point out he is not the Mr. J. Entwistle whose retirement from the Simplex Electric Co., Ltd., was announced in our issue of June 27th. Mr. J. Entwistle of the Mersey Cable Works, who was connected with the Simplex Electric Co. for a short period before the war is anxious that his friends should know that he has not retired and still remains a director of H. J. Baldwin & Co., Ltd.

Mr. A. M. Perry asks us to correct two errors in the note in our last issue upon his appointment as deputy borough electrical engineer of Grimsby. He joined the Hackbridge & Hewittic Companies in 1931 (not 1921) and was electrical factory inspector for the Midlands Area in 1942 (not 1924).

The annual sports and fête of the London and Home Counties Joint Electricity Authority's Sports and Social Association was held for the first time since 1939, on Saturday, June 28th. Over 1,500 members and friends were present in the grounds of Burford House, and the chairman of the Authority, Mr. Henry E. Goodrich, brought a party. Mr. Norman Elliott, the general manager and chief engineer, refereed the sports. The inter-district contest for the Chuter Ede Challenge Bowl was won by Twickenham. The fête included horticultural and model engineering exhibitions and numerous side-shows. After Mrs. Goodrich had presented the prizes, the chairman made a presentation to Mr. A. L. Burnell, clerk and finance officer, from the Sports and Social Association, in recognition of fourteen years' service to the Association.

Obituary

Mr. W. H. Turner, chairman and managing director of the Yorkshire Switchgear & Engineering Co., Ltd., died on July 6th in his seventy-fifth year. He was one of the founders of the company in 1907. He was also a director and founder of the associate company, Electro-Mechanical Manufacturing Co., Ltd.

Mr. W. C. Scott.—The death is announced of Mr. William C. Scott, Aberdeen, on the eve of his retirement from the Corporation Electricity Department after forty-four years' service. He had been assistant station engineer for the past twenty-nine years.

Mr. W. C. C. Hawtayne.—We regret to record the death, on July 4th at New Milton, Hants, of Mr. William Charles Cloete Hawtayne,

M.I.E.E. Mr. Hawtayne was born in Quebec in 1863. For many years he had been consulting engineer to a large number of electricity supply undertakings, as well as tramway and light railway concerns and industrial establishments.

Mr. W. Rennie, M.I.E.E., sales manager and director of Watson & Sons (Electro-Medical), Ltd., died suddenly in the office on July 4th. He was with the company for twenty-six years and was secretary of the Industry Committee of the British Institute of Radiology.

Wills.—Mr. Howard E. Chasteney, H.M. Chief Inspector of Factories, left £4,997 (net personalty £4,910).

Mr. J. McKenzie Robson, of Chalfont St. Peter, Bucks., retired electrical engineer, who died on October 14th last, left £3,212 gross, with net personalty £2,838.

Mr. W. R. Holmes, of Horsham, Sussex, electrical engineer, who died on December 26th last, left £10,610 gross, with net personalty £10,519.

Mr. A. Bonnin, M.A., for many years a director of the North-Eastern Electric Supply Co., Ltd., who died on January 12th last, left estate in Great Britain valued at £4,630 gross, with net personalty £2,369.

Mr. W. R. Holland, B.Sc., of the A.C. Engineering Dept., B.T.H. Co., Rugby, who died on March 10th last, left £5,575 gross, with net personalty £4,994.

Parliamentary News

By Our Special Reporter

THE Electricity Bill was introduced into the House of Lords on July 1st and read a first time. The second reading was taken on Tuesday last.

Electrical Steel Sheet

Mr. Skinnard recently asked the Minister of Supply, whether, in view of the difficulty experienced by small industrial units in obtaining a fair proportion of the available supplies of electrical steel sheet used in the manufacture of telecommunication equipment for export, he would apply controls similar to those imposed on the distribution of mild steel sheet.

Mr. Wilmot said that the arrangements for the distribution of electrical sheet, which was controlled by his Department, were at present being reviewed. While the present shortage continued, priority must be given to programmes directly contributing to the expansion of fuel and power resources, and supplies to other users must, therefore, be restricted.

Bankside and Central Heating

Mr. Shinwell, Minister of Fuel and Power, in a written reply to Mr. Parker, says that the purpose of the Bankside station is to provide additional electricity in the London area at the earliest possible date. The owners of the station have, however, undertaken to give full consideration to the question of district heating when the local authorities concerned are in a position to state their heat requirements. The provision of an external heating system would affect the design of the plant but would not reduce the size of the station.

International Standardization

THE first meeting of the Council of the International Organization for Standardization (I.S.O.) since the ratification of its constitution (which was drafted in London last October at a meeting of twenty-eight nations) was held in Zurich from June 17th to 20th. The Council consists of the national standards bodies of Australia, Belgium, Brazil, China, France, India, Norway, Switzerland, United Kingdom, the United States and Russia.

The meetings were presided over by Mr. Howard Coonley, of the U.S.A., president of I.S.O. The Council appointed M. Henri St. Leger to be general secretary; his office will be situated in Geneva.

An extensive programme of technical work will be submitted to the standards organizations in the different countries for consideration.

The International Electrotechnical Commission also held a meeting of its Council under the chairmanship of its president, M. Emile Uytborck, of Belgium. As a result of the joint meeting between the I.E.C., and the I.S.O., it was agreed to recommend to the constituent members of the I.E.C. that the Commission should affiliate with the I.S.O.

London J.E.A.

AT the meeting of the London and Home Counties Joint Electricity Authority held last week it was reported that the Electricity Commissioners had given their formal consent to the following extensions:—City of London Electric Lighting Co.'s Bankside station, two 52,500-kW turbo-alternator sets and four 320,000 lb/hr oil-fired boilers; Fulham Borough Council's Townmead Road station, a 60,000-kW turbo-alternator set to replace an existing 10,000-kW set; and the Kent Electric Power Co.'s Littlebrook station, two 60,000-kW sets and four 300,000 lb/hr boilers. Sanction has been received by the Authority to loans of £120,000 for mains and services and £2,000 for meters. The Metropolitan Electric Supply Co., Ltd., has applied for consent to construct main transmission lines from Willesden to Wembley, Slough to Windsor and Hayes to Hounslow.

The Authority's Local Distribution Committee has recommended mains and service extensions costing £54,814. It is proposed to approach contractors for the renewal of contracts for cables, transformers, transformer kiosks and electrical accessories.

Single-phase Repulsion Motors

Construction and Principles of Operation

By "Rotor"

VARIOUS types of single-phase motor operate on the repulsion principle, either during starting or starting and running. The simple repulsion motor (Fig. 1) has a laminated stator, usually of the consequent-pole type, with its windings connected to the supply; often two or more vacant slots are left in the centre of each pole. The rotor winding is similar to that of a lap- or wave-wound armature of a d.c. motor and is connected to a commutator, the brushes being short-circuited together.

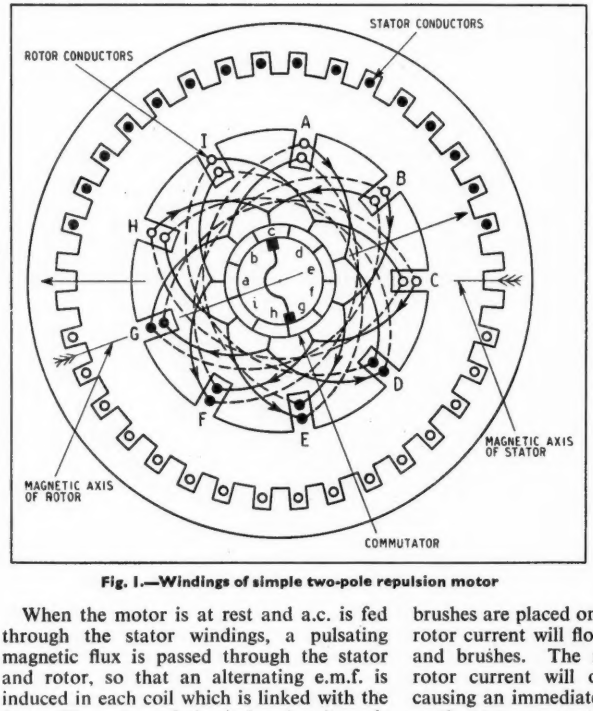


Fig. 1.—Windings of simple two-pole repulsion motor

When the motor is at rest and a.c. is fed through the stator windings, a pulsating magnetic flux is passed through the stator and rotor, so that an alternating e.m.f. is induced in each coil which is linked with the flux. The value of the induced voltage is proportional to the strength of the linked flux and to the frequency of the supply. Maximum e.m.f. will thus be induced in rotor coils whose axis coincides with that of the stator flux and which embrace maximum flux, such as the coil consisting of conductors in slots A and E and connected to commutator segments e and f.

Zero e.m.f. will be induced in rotor coils which lie along the axis of the magnetic flux, since the direction of the induced e.m.f. in conductors lying below the magnetic axis of the stator will oppose that in conductors lying above the axis. When the brushes are raised from the commutator the sum of the static induced e.m.f's which act round the rotor windings will be zero and no rotor current will flow, as in the case of a d.c. dynamo. The magnetizing current drawn from the mains by the stator winding will then be merely that necessary to create magnetic flux of sufficient strength to create a self-induced stator voltage of sufficient strength to limit the stator current to the desired value.

With the rotor at rest maximum induced voltage will exist between commutator segments such as c and h connected to rotor coils lying on opposite sides of the stator magnetic axis, these segments dividing the rotor winding into two parallel circuits. If the short-circuited brushes are placed on these segments a heavy rotor current will flow through the windings and brushes. The magnetic effects of the rotor current will oppose the stator flux, causing an immediate weakening of the flux, so the stator current increases to restore the magnetic flux practically to the original value. With this brush position, which is termed the "hard neutral," the motor acts as a transformer with short-circuited secondary

winding, having a high magnetizing current and leakage flux owing to the primary and secondary windings being separated by the air gap between stator and rotor. With this brush position the torque set up by current

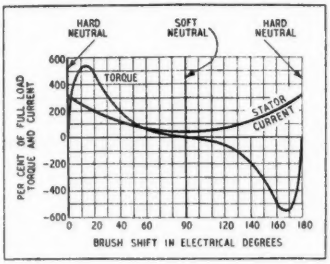


Fig. 2.—Effect of brush position on repulsion motor

in rotor conductors on one side of the stator-flux axis will be in opposition to that set up by rotor current on the opposite side of the axis, so that hard-neutral brush position gives high stator and rotor currents but zero torque.

If the brushes are placed on segments a and e.f. the static induced e.m.f's in rotor conductors in each parallel rotor circuit formed by the brushes will not be in the same direction and the total e.m.f. in each rotor circuit will thus be zero. Consequently "soft neutral," as this brush position is called, gives zero rotor current, minimum stator current and no torque.

In order to create both rotor current and torque the brushes must be placed on some intermediate segments, such as c and g, in which position the total e.m.f. and current in each of the parallel rotor circuits will be less than maximum, but the magnetic axis of the rotor will be inclined at an angle to that of the stator. The torque will tend to turn the rotor in the direction of brush shift from hard neutral. The brushes are usually set about 15 to 20 electrical degrees from hard neutral, the torque created depending on the brush shift (Fig. 2). The direction of rotation will depend on the direction of brush shift from hard neutral, and in some cases speed control is effected by brush movement.

The hard-neutral position is distinguished by the fact that a slight brush shift causes rotation. Soft neutral is less clearly defined and an appreciable brush movement from this position may be necessary to cause rotation in a direction opposite to that due to brush shift from soft neutral. The torque due to currents in individual coils which are short-circuited during commutation, such as those in slots C and G, will be opposite to the general rotor torque. The induced static e.m.f. in these conductors is, however, low and the torque can be kept within limits by using a large number of coils with few turns in conjunction with narrow high-resistance brushes.

With the brushes raised from the commutator and the rotor at rest the amp turns A_B of the stator (Fig. 3a) can be considered to create two component magnetic fields, viz., ϕ_T along the magnetic axis of the rotor and ϕ_E at right angles to the rotor magnetic axis. These fluxes will create static induced e.m.f's E_1 and E_2 in the rotor windings (Fig. 3b) to act along the brush axis and at right angles to it. The flux will also create a reactance

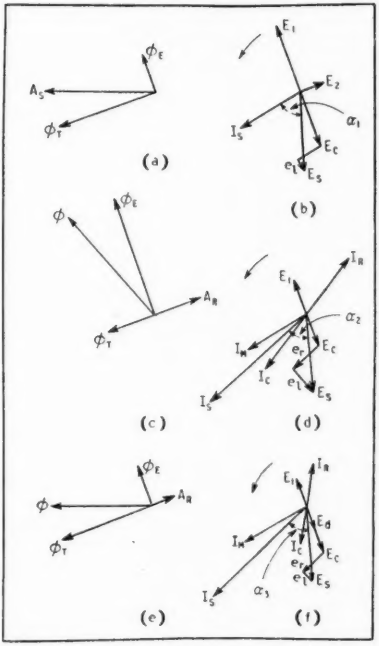


Fig. 3.—Operating conditions in repulsion motor

voltage E_C in the stator windings and leakage reactance voltage e_l so the applied stator voltage E_B will supply the stator current I_B at low power factor cos $\alpha 1$.

When the short-circuited brushes are placed on the commutator to cause the magnetic axis of the rotor to act along the axis ϕ_T rotor current will flow and the resultant rotor amp turns A_R will oppose ϕ_T (Fig. 3c). They can be considered to divert the stator flux and to cause increased leakage flux along the axis ϕ_E. With this brush position the resultant static induced e.m.f. in the rotor windings due to ϕ_E will be zero. Since the flux ϕ_T is now less than before E_1 will be reduced; the resulting rotor current I_R will lag behind the rotor voltage E_1 due to leakage reactance of the rotor. Assuming the number of rotor turns along the ϕ_T axis is the same as the number of stator turns the stator will now draw a current I_C to balance the rotor current I_R, so the total stator current will be I_S (Fig. 3d). There will be a stator reactance voltage E_C equal to E_1 and a stator reactance volt drop e_l due to the leakage flux ϕ_E. The applied stator voltage is represented by E_S and the stator resistance volt drop by e_r.

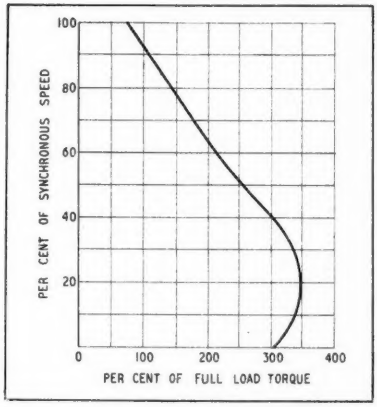


Fig. 4.—Speed-torque relationships of typical repulsion motors

When the rotor revolves its conductors cross the stator magnetic field and there will be two dynamic e.m.f's created in its windings, one due to the cutting of ϕ_T and the other due to the cutting of ϕ_E. The brushes are so placed that the dynamic e.m.f. due to ϕ_T is cancelled out in the rotor windings as a whole. The strength of the flux ϕ_E will govern the value of the dynamic e.m.f. E_d, as will also the speed of rotation. Referring to Fig. 1 it may be seen from Fleming's right hand rule that the dynamic e.m.f. due to ϕ_E will oppose the static induced e.m.f. due to ϕ_T. Consequently as E_d increases with increased speed the rotor current I_R will fall. The reduced rotor amp turns A_R will allow ϕ_T to increase and ϕ_E to fall. (Fig. 3e). Reduced rotor reactance voltage due to reduced rotor frequency will cause the rotor current to come more into phase with the resultant rotor voltage. There will also be reduced stator reactance-volt drop due to ϕ_E, so the stator power factor will increase to cos $\alpha 3$ (Fig. 3f). After the motor has accelerated to a steady speed at which the motor torque is equal to the load torque, an increase of load will cause reduced rotor speed, reduced dynamic voltage E_d, with increase of stator and rotor current and torque, and reduced power factor, until conditions once again become stabilized at a lower speed and the required higher torque (Fig. 4).

It is a characteristic of the repulsion motor that its torque falls with increase of power factor. Since the fluxes along the energy axis (ϕ_T) and along the excitation axis (ϕ_E) are 90 degrees out of phase and are also mutually perpendicular the motor has a rotary magnetic flux. In an ideal machine with no losses or leakage the rotary flux would have a constant magnitude at synchronous speed. In practice the resultant field is somewhat elliptical, minimum excentricity occurring at a speed slightly above synchronism. Below this speed the flux along the energy axis is lower than along the excitation axis, the reverse applying above this speed.

At synchronous speed, if the motor field were uniform as in an ideal machine, there would be no core loss in the rotor and no circulating currents in the coils undergoing commutation, since the resultant magnetic field would be stationary with respect to the

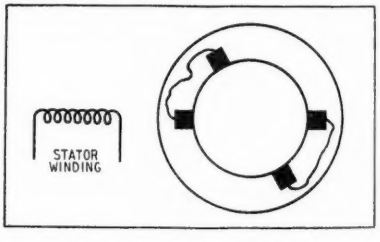


Fig. 5.—Brush-shifting Deri motor

rotor coils. Commutation would then be influenced merely by the reactance voltage in the short circuited coils. The field ϕ_T can be regarded as a commutating field for the short-circuited coils. At synchronism the dynamic or commutating e.m.f. generated in the short-circuited coils by rotation in flux ϕ_T would neutralize the static e.m.f. induced by transformer action by ϕ_E. Below synchronous speed the commutating e.m.f. would be lower than the static e.m.f., whilst above synchronous speed the commutating e.m.f. would be too strong. In both cases circulating currents will flow in the commutated coils.

Above synchronous speed the flux ϕ_T increases rapidly with increase of speed, thus there are heavy core losses in addition to increased circulating currents in the commutated coils. Because of these effects the repulsion motor is not very suitable for operation at much above synchronous speed, methods of weakening the field ϕ_T in the commutating zone being advisable at higher speeds. A repulsion motor designed for a low-frequency supply would, therefore, have a small number of poles, except in the case of a very low-speed machine, so the motor would be relatively heavy. For this reason the repulsion motor is not very suitable for low-frequency systems, but is suitable for fairly high voltages.

Reversing Methods

The simple repulsion motor can be reversed by movement of the brushes to the other side of the hard-neutral position. Another type of simple repulsion motor, which can be reversed by means of a switch without alteration of brush position, has two sets of brushes which may ride either on the same or on separate commutators. For one direction of rotation one set of brushes is short-circuited and the other left open-circuited, whilst the opposite direction of rotation is obtained by open-circuiting the first set and short-circuiting the second set. This motor is suitable for " plugging," i.e., changing from full speed in one direction to full speed in the opposite direction by switching operation.

Simple repulsion motors of small size can be started by switching direct on to the mains, a graduated starting resistance being advisable for larger motors to limit starting current.

A limited amount of speed control can be obtained by movement of the brushes, but this method is unsuitable for other than small motors, as a very small movement of the brushes would produce a large variation of torque, the motor being very sensitive to brush position. In addition excessive currents would be circulated in commutated coils when the brushes were in the position of zero torque. In the Déri repulsion motor these difficulties are overcome by using a double set of brushes, one set being fixed with consequent rotor magnetic axis in line with stator magnetic axis, and the other set movable round the commutator (Fig. 5). The two sets of brushes are interconnected. When each set of fixed brushes is in line with the movable set to which it is connected, the rotor windings will be externally open-circuited; the resultant voltage round the rotor windings will be zero, so there will be no rotor current or torque. Under these conditions the motor would merely draw magnetizing current from the mains.

When the movable brushes are separated from the fixed brushes the only rotor conductors which are acted on by the stator flux will be those embraced by the angle of brush movement, so the torque can be controlled gradually. It is possible to arrange for maximum torque to correspond to brush displacement by as much as 155 deg, with torque proportional to brush displacement over a range of 90 deg of brush shift. By connecting resistance between the brush sets the shape of the speed curve can be altered and regenerative braking obtained. Commutation above synchronous speeds is unaffected by brush position. Commutation at other speeds can be controlled by commutating poles, which is not possible in a simple motor with control by brush shift.

Research on Springs

THE Coil Spring Federation established in 1942 to co-ordinate the production of springs required for weapons has set up a research organization for carrying out investigations into design, materials and methods. The organization is financially aided by the Department of Scientific and Industrial Research on the basis of contributions by members of the Federation. Associate membership is open to concerns which are not spring manufacturers. Further particulars can be obtained from the secretaries, Peat, Marwick, Mitchell & Co., 301, Glossop Road, Sheffield, 10. As a first step towards the establishment of a central laboratory, the scheme provides for extra-mural researches by post-graduate assistants at universities, those in hand relating to the effects of surface protection on the behaviour of springs and to the properties of cold-drawn spring wire.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Copper Cable Box

THE latest cable jointing accessory announced by BRITISH INSULATED CALLENDER'S CABLES, LTD., Norfolk House, Norfolk Street, Strand, London, W.C.2, is a pressed copper service box as an alternative to the lead box which is now scarce. It is lighter, of greater mechanical strength and able to withstand

Pressed copper service box within cast-iron protective enclosure

more rough treatment in handling, in transit, or in storage; consequently it arrives in the jointer's hands in much better shape, which means that he does not have to spend his time dressing out dents in lengthy preparations for jointing and plumbing. Although primarily designed for enclosure within protection boxes, the strength of the pressed copper makes it much more adaptable than lead to improvized methods of protection against mechanical damage and corrosion. Where cast-iron protection boxes are not considered necessary, cover tiles can be placed below and above the copper box, with bricks round the sides ready for filling with compound; a bonding attachment is available for use in such cases.

The boxes are made in two halves from hot-tinned copper sheet 1/32 in. thick of high drawing quality. A range of eight boxes caters for the usual sizes of branch and mains cables, the larger sizes being ribbed for greater strength. By virtue of the special design of the cable entries, each box will accommodate a range of cable sizes, the copper sheet being scored axially so that it readily opens up to form "fingers" to fit the cable sheath.

Gas-Pressure Recorder

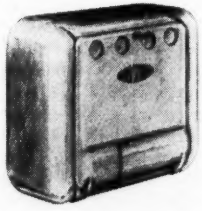
A distant recorder which enables attendants in gas works to see at a glance changes of pressure throughout a distribution network has been placed on the market by EVERSHED & VIGNOLES, LTD., Acton Lane, Chiswick, London, W.4, by whom it has been developed jointly with Mr. H. C. Widlake.

The transmitter usually incorporates a U-tube manometer and an electrical repeater for reproducing the indications at a distance. Two wires only (P.O. lines may be hired for the purpose) are needed between transmitter and receivers; the latter are connected in series and may be indicators or graphic pen recorders, several of which may be simultaneously actuated by one transmitter. Adjustable relay receivers can be furnished to give warning of pressure changes or for exercising control automatically. The instruments may be mains or battery energized.

Switch-fuse and Cooker-control Boxes

An unusually designed switch-fuse box has been patented by FUSICATORS, LTD., 114, Anerley Road, Upper Norwood, London, S.E.19. The metal box is pressure die-cast, of 8 by 8¼ by 3 in. projection, finished in colours with a ripple effect. The slackening of four screws enables the door and shell of the box to be removed for complete access to the back plate, which remains fixed to the wall.

Model PL. 515 is of the two-way double-pole pattern containing four moulded fuse carriers, protected by insert barriers at the "flash points." The blowing of a fuse is indicated by a red light through one of the four circular disc apertures in the lid of the box; also an inspection light with switch beneath the box facilitates rewiring the fuse holders and examination of the meter and wiring. In addition, two sockets at the side of the box provide for an ordinary domestic bell circuit, which is separately protected by a cartridge fuse, without the necessity for a step-down transformer or batteries.



Die-cast switch-fuse box with pilot lamp apertures in door

The switch arm projects through the front of the box, serving also to secure the door in the "on" position, while three differently positioned feed-out entries allow for a.c. lighting and power circuits of 5 and 15 A at 250 V.

A cooker-control box of similar arrangement is shortly to be introduced. In this case one of the red light apertures will be the mains switch on-off pilot while the other three will be fuse indicators for the 15-A socket at the side of the box for a kettle and the two 30-A cooker fuses.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Earthing Conductors

IT would be interesting to know whether the views of Mr. R. E. Bristow in your issue of June 27th, are those of the Institution of Electrical Engineers. It is time some competent body said whether this new method of running earth wires inside metallic tubes is the correct way or whether the long-standing practice of running the earth wire outside the tube is preferable. I agree with him as to the importance of the earth wire.

If his statement is correct that " there is only one place for the earth wire and that is inside the flexible conduit," then thousands of these connections throughout industrial Britain must be altered.

Croydon. F. T. BAUGHEN.

Nuclear-Physics Research

FOR a long time there has been common ground between electrical engineering and nuclear-physical research. The overlap has been particularly obvious in the development of particle accelerators. In general, the development of the experimental tools of the nuclear physicist has envolved electrical engineering techniques of many kinds and many orders of magnitude. In view of the present prospects of application of nuclear physics to power production, fundamental and applied nuclear research will have to be carried out on a much more extensive scale than hitherto.

The development, improvement, and relatively large-scale production of particle accelerators of ultra-high energy, 500 M.E.V. and higher, will be one electrical engineering problem that will assume proportionately increased importance.

So much for electrical engineering's role in advanced research. But what about the training of the future advanced research workers and the technical personnel who will handle the products of their research?

Clearly, much more emphasis will have to be placed on nuclear physics, both theoretical and experimental, in the training of physicists and engineers in universities. It will be highly desirable, if not essential, for nuclear-physical work to be part of the laboratory experience of undergraduate as well as post-graduate students. How many universities at present turning out physicists can afford to equip their laboratories with nuclear-physical apparatus for training purposes and post-graduate research ? For many the cost and complexity of the available apparatus is prohibitive.

This is essentially an engineering problem —to produce nuclear-physical tools at a cost that will make them available for training purposes on a wide scale. Regarding particle accelerators, the problem is not to produce still higher energies but to produce relatively low-energy accelerators of high economic efficiency. It is suggested that it would be well worth while for the electrical industry to explore the market potentialities of this type of equipment and to step up research and development work along these lines.

M. J. PENTZ, B.Sc.(Elec. Eng.), M.Sc.
F. F. HEYMANN, B.Sc.(Elec. Eng.)
Stretford, Manchester.

Transformer Iron

YOUR editorial " Transformer Iron " (June 20th) renders great service in drawing attention to the severe handicap under which transformer makers in this country are working because of the relatively poor qualities of electrical sheet steel available.

Before the war it was possible to obtain in commercial quantities steel having an average test loss of 0·52 W per lb at 50 cycles and B = 10,000. At the present time, little iron better than 0·59 W is available. Comparison of either of these values with the American figures quoted by Mr. Edmundson and referred to in your editorial of 0·35 W for hot-rolled iron and 0·23 W for cold-rolled iron shows clearly the inferiority of British steels.

In the export market, therefore, the British designer must endeavour to approach competitive no-load losses by employing lower current and flux densities, thus using a greater quantity of iron or copper and probably of both. If the bulk supply of steel of a quality greatly superior to the present standard is not soon achieved, then unless America meets her export trade in transformers through British subsidiaries

using British steel, the future export prospects of the transformer industry in this country are very poor indeed.

Cold-rolled iron is only obtainable as yet in small quantities of little more than experimental value. The best sample I have experienced had a loss of 0·43 W, i.e., worse than American hot-rolled iron and nearly double the loss of American cold-rolled iron. The better qualities of hot-rolled iron with the higher silicon contents tend to brittleness and this may seriously affect cutting, punching and handling operations generally. On the other hand, the loss factor of cold-rolled iron is very sensitive to these operations—so much so that subsequent annealing processes and heat treatments are necessary at various stages in manufacture, not only of the sheet steel itself but also of the actual core, in the transformer makers' works.

The relative merits of hot- and cold-rolled iron and their future applications are not yet clear and still depend upon many practical considerations. The directional feature of cold-rolled iron and the heat treatment requirements involve complicated core construction. Some considerable improvement in loss factor will be necessary merely to justify these additional manufacturing costs.

For many years transformer makers have been promised improvements in British steel and these promises are reiterated by both Mr. Locke and Sir Geoffrey Clarke. Sir Geoffrey, in the last sentence of his letter, indicates that the immediate large-scale production of steel equal in quality to American steel is not a matter of technique or raw materials or "know-how," but merely of obtaining manufacturing plant. If the case is as simple as this, surely the highest priority for this construction should be pressed for in the highest quarters. Apart from considerations of export trade, the lower-loss steel will greatly reduce the materials—both copper and iron—required for generating and transmission plant in this country as well as improve their efficiency, i.e., their coal consumption.

Hollinwood. E. T. NORRIS.

D.C. versus A.C.

WITH reference to my article in your issue of March 28th Dr. Ehrensperger and I have had a lot of correspondence, and he has very courteously put at my disposal, copies of the *Brown Boveri Review* for October, 1941, and September, 1945, the latter of which, in particular, amplifies some points in C.I.G.R.E. Conference Paper No. 103.

I have made some preliminary investigations into the points at issue, and am inclined to think that his figures are nearer the truth than I at first believed possible. The matter presented in his C.I.G.R.E. paper is only a short report on a very long and arduous work and perhaps cannot therefore be expected to give sufficient explanatory details to enable a fair criticism of these figures to be made without one being involved in very laborious calculations; and pressure of other work compels me to make a halt.

There is one point, however, where I feel that nothing has been put forward to satisfy our legitimate anticipations of trouble with d.c.; that is, how does Dr. Ehrensperger deal with momentary overloads of 20 to 40 per cent coming upon the receiver at full load in, say, 0·05 sec.? These loads will have to be faced if railway or rolling-mill work are to be undertaken. Perhaps Dr. Ehrensperger will kindly explain how he would deal with these?

My apologies to Mr. Giesbers whom I thank for his kind effort.

Birmingham. A. M. TAYLOR,
Director, Economic Transmissions, Ltd.

Paralleling Diesel Sets

I AM looking into the question of running four or five Diesel-driven 30-kVA, three-phase, 50-cycle, four-wire, 400-V alternators in parallel, as stand-by to take peak loads of the factory off the supply undertaking.

Synchronizing will have to be as simple as possible, as elaborate equipment is not now readily available. I should greatly appreciate the views of your readers on the practical aspects of dark- or light-lamp methods, including possible effects of mechanical shocks through errors of judgment in switching and other points to be considered in parallel running.

Nottingham. S.L.

Engineering Units

I HAVE not seen any replies to the appeal in your issue of June 13th for abbreviations for x-million British Thermal Units. May I suggest either of the following :—Megathermits (M.T.M.'s) or megabritus (M.B.U.'s).

*London, E.C.*4. S. G. BLAXLAND STUBBS,
General Editor,
"The Electrical Encyclopedia."

Power Station Developments

British and Foreign Plans for Meeting Deficiency

HOW different countries propose to meet the universal deficiency in generating plant was an implied theme of three papers presented at the centenary meetings of the Institution of Mechanical Engineers. One by Sir Johnstone Wright (general manager, Central Electricity Board), referred to the circumstances which had determined the provision of new plant during the past twenty years and showed that, although construction had been at a minimum during that period, installed capacity had increased 2¾ times. The paper went on to give design particulars of the six-million-kW plant programme, which had been planned as a co-ordinated whole to cover the period up to 1950. The programme provided for the building of eighteen stations, but it was becoming more difficult, the author said, to secure technically suitable sites, while the reconstruction of older stations was hampered by the need to retain existing plant in service. In the decade after 1950 up to 1½ million kW would have to be installed each year.

Manufacture was being facilitated through standardizing designs for 95 per cent of the six million kW, of which 49·3 per cent (80 turbines, mostly 30,000 to 45,000 kW, and 154 boilers as extensions would operate at about 600 lb per sq in. and 800 to 900 deg F and 38·3 per cent (42 turbines, 50,000 to 60,000 kW, and 90 boilers almost all in new stations) at 900 lb and 900 to 925 deg. Duplicates of existing 300 to 415 lb units would account for 7·4 per cent (17 turbines and 35 boilers), while the non-standard 5 per cent (six turbines and nine boilers) would have steam conditions of 1,200 to 1,400 lb per sq in. and 825 deg (with reheating) or 950 deg F.

For 3,000-r.p.m. turbines three standard frame sizes were being introduced, including one for sixty three-cylinder 50,000- and 60,000-kW units (with common low-pressure cylinders) working at 600, 900 or 1,250 to 1,450 lb. On a number of larger machines with throttle governing free from nozzle and overload valves, full load would be the most economical rating. Two-pole, 60,000-kW, 3,000-r.p.m. alternators would generally be hydrogen-cooled. Four standard sizes of boilers were being adopted, of from 200,000 to 540,000 lb per hr capacity, of which half (all pulverized fuel) were in the 300,000 to 365,000 lb range; nearly as many were duplicates of those in existing stations.

Stations would usually be in self-contained sections, each comprising two turbines and four boilers, any three able to supply the full steam requirements. In a few instances, where fuel was suitable, one boiler and one set would form a unit. Out of a total evaporative capacity of some 73·5 million lb per hr in the programme, 27·4 per cent would be associated with chain-grate and retort stokers, 5·7 per cent with spreader stokers and 66·9 per cent with pulverized fuel. By 1950, 17 million tons of coal would be stoker fired compared with 18 million in 1945, whereas 10 million tons would be pulverized as against 4·5 million in 1945.

Operation of larger boilers at sustained loads had reduced their availability owing to the formation of bonded deposits in external heating surfaces as a result of distillation of incombustible volatiles from the high-temperature coke zone. Modifications in design and operational methods had greatly improved performance and some stoker-fired boilers were capable of 5,000 to 6,000 hours' operation per annum, while many p.f. units remained continuously in service between annual overhauls, sometimes up to 18 months during the war. Spreader firing, which would be applied to over 4 million lb per hr of capacity by 1949, was expected to give little trouble from deposits; it should enable many medium-sized stations to be reconstructed economically.

Looking further ahead, schemes were being worked out for 15,000-kW and 20,000-kW oil-fired open-cycle gas turbines for dealing with peak loads and also for 30,000-kW sets, some embodying double flow in the low-pressure compressor and gas turbine. As soon as research enabled clean gas to be produced from normal fuel, units might be designed to give 50,000 to 100,000 kW on the closed-cycle system with compressor and turbine frames of similar physical dimensions to those now being developed for 15,000 to 30,000 kW on the open cycle. With improved steels permitting higher inlet-gas temperatures, thermal efficiencies of 45 per cent or more might be realized and, in the event of developments in nuclear fission, designs would be immediately forthcoming. In conclusion Sir Johnstone referred to the beneficial effects that would follow a rational zoning of coal supplies. It would simplify and cheapen boiler construction, facilitate standardization and bring about a wider adoption of the unit principle of one boiler per turbine, resulting in material savings in capital expenditure.

American Practice

Steam conditions of 850 lb per sq in. and 900 deg F have been found to give the most economical performance in the United States, according to a digest of the practices and opinions of plant designers and station operators given by Professor A. G. Christie (Johns Hopkins University, Baltimore), but 1,250 lb and up to 1,550 deg would be used in some new stations. The unit system of one boiler per turbine was, he said, becoming usual practice.

A governing feature in furnace and boiler design was the fusing point of ash which in United States coals varied from 1,800 to 2,700 deg F. Dry-bottom furnaces operated satisfactorily over a wide range of load, but wet-bottom furnaces were also used with coals having low-fusion ash, while spreader stokers, which were adaptable to different coals, were finding increasing application.

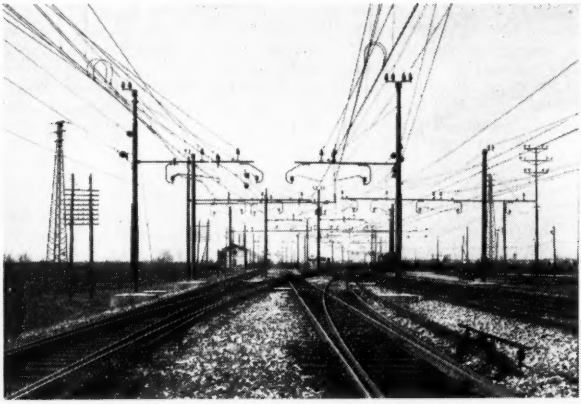
Six "preferred standards" for turbo-alternators from 11,000 to 60,000 kW had been adopted by a joint committee of the American Society of Mechanical Engineers and Institute of Electrical Engineers. These provided for hydrogen cooling for 3,600-r.p.m. sets of 20,000 kW and above, at 0·5 lb per sq in., though 15 lb was also found. Sets of this speed were available up to 80,000 kW and for 1,800 r.p.m. up to 165,000 kW.

Continental Methods

In dealing with European practice, Dr. A. Meyer (Brown Boveri) stated that schemes were apt to be conditioned by varying optimism, politics and the availability of foreign money, which were often more powerful than technical considerations. Little progress was made during the war and thereafter the urgent need for power and the extent of the damage to electrical equipment made improvisation necessary and very few new features could be introduced. Eleven new stations were to be built in Holland with an aggregate capacity of 900,000 kW, including four 50,000-kW sets in two 300,000-kW stations with steam conditions of 1,180 lb per sq in. and 930 deg F. In Belgium some 800,000 kW had been arranged for by 1950, with steam conditions usually not exceeding 850 lb per sq in. and 930 deg F.

A French five-year plan foresees an increase in consumption of 85 per cent, bringing the figure up to 40,000 million kWh in 1951, of which 41 per cent would be generated in thermal plants. Two two-cylinder 100,000-kW sets for 1,300 lb and 970 deg F were on order for Gennevilliers with five boilers to each. Three new power stations of an aggregate capacity of over 600,000 kW would be fed with blast-pressure gas from works several miles away.

In Switzerland gas turbines of up to 27,000 kW were under construction for working on the winter peaks: the guaranteed thermal efficiency of the largest would be 34 per cent and temperatures would be 1,112 deg F before the h.p. and 1,022 deg before the l.p. turbine. Spain would require a further 850,000 kW (38 per cent thermal) by 1951. Future developments in Italy would depend almost entirely on thermal stations and projects included two 50,000-kW installations for 1,150 lb per sq in. and 950 deg F. The paper contains less detailed notes about other European countries.



View of the overhead equipment on the Milan-Domodossola line

Italian Electrification

As a result of the electrification of the 75 miles of line from Milan to Domodossola (the Italian section of the Simplon railway) the journey time between these two places has been reduced from 2 hr 55 min to 1 hr 45 min. The railway is double-track from Milan to Gallarate with a maximum gradient of 6 per cent. Thence to Arona the track is single with a maximum gradient of 12 per cent and includes a tunnel 600 yd long, after which descent is made to the Ticino River, which is crossed by a bridge 300 yd long. From Arona to Domodossola the track is again double with gradients of less than 6 per cent.

As the Swiss locomotives are operated at 15,000 V single-phase and the Italian on the 3,000-V d.c. third-rail system, an interchange is made when entering Domodossola terminus. Three substations, each containing two 2,000-kW rectifiers, have been erected at Gallarate, Arona and Vogogna; power is derived from the 45-kV three-phase public network. The average speed of the trains has been raised from 37 to 75 m.p.h. With steam 177 lb of coal was burned per 1,000 ton-miles, whereas 46·7 kWh is now taken. Although the latter costs more than the corresponding amount of coal (which has to be imported), the overall costs are lower largely on account of the elimination of the stand-by losses incurred by the steam locomotives.

COMMERCE and INDUSTRY

Purchase Tax Decision.

THE Chancellor of the Exchequer has decided to remove the purchase tax imposed in the Budget upon wash-boilers and refrigerators. He had previously remitted the tax (66⅔ per cent) upon cookers and cooking appliances, kettles and irons. He has also decided not to raise the tax from 33⅓ to 66⅔ per cent on washing machines, vacuum cleaners, floor polishers and sewing machines. Thus the imposition of the 66⅔ per cent tax is confined to space heating appliances, water heaters and lawn mowers.

As in the case of cookers, etc., the tax paid on exempted appliances bought since Budget Day (April 16th) and the extra tax paid on vacuum cleaners, etc., will be refunded by the retailers to the purchasers.

Electrical Employment

Statistics of the numbers employed in industry in April last, published in the *Ministry of Labour Gazette*, show that the number of adult males in the electrical engineering industry was approximately the same as in mid-1939 but a large increase in the number of women and girl workers raised the total to about 17·4 per cent above the 1939 figure. Employment in the wiring and contracting industry was well above the 1939 level; although the number of female workers employed was doubled they still represented only about 10 per cent of the total. The numbers employed in the electrical apparatus, cables, lamps, etc., group were substantially greater than in 1939, mainly on account of the influx of women workers who are now almost equal in numbers to the men. Details are given in the accompanying table.

Employment During April, 1947 (Thousands)

Branch	Males (14-65)			Females (14-60)			Total		
	Mid-1939	Mid-1946	April, 1947	Mid-1939	Mid-1946	April, 1947	Mid-1939	Mid-1946	April, 1947
Electrical engineering ..	105·9	99·9	105·8	28·0	53·2	51·4	133·9	153·1	157·2
Electrical wiring and contracting	38·9	45·5	47·3	2·8	5·4	5·6	41·7	50·9	52·9
Electrical apparatus, cables, lamps, etc.	116·4	117·4	137·6	79·5	126·8	131·2	195·9	244·2	268·8

On May 12th there were 2,495 (661 women) in the electrical engineering industry registered as unemployed. The total in the wiring and contracting industry was 1,533 (69 women) and that for the electrical apparatus group 3,647 (1,486 women).

Brazilian Electrical Imports

The *Board of Trade Journal* publishes a list of goods which are considered by the Brazilian authorities to be "essential for the national interest" and on this account are not subject to the general necessity for the obtaining of import licences in advance. The list includes generators, accessories and parts; electric welding plant; Diesel-electric sets; condensers, transformers, rectifiers, convertors and battery chargers; transmission and distribution apparatus; electric furnaces; electric locomotives; refrigeration equipment; electrical testing instruments; and air compressors.

Avoiding Load Shedding.

Birmingham Power Proposals

At a meeting of the Birmingham City Council last week the Electric Supply Committee put forward a plan by means of which it is hoped to ease the effect of load cuts next winter. It provides that the Central Electricity Board should be asked to "ration" each undertaking to a definite quota of kilowatts; that all consumers should be urged to bear the burden according to a clear-cut programme; that cuts should be carried out to a predetermined rota for all classes of consumer; and that a planned and persistent publicity campaign should be carried out to bring home to each consumer the precise requirements.

Councillor E. J. Haynes, who presented the report stated that the city's electricity undertaking had 142,000 tons of coal in stock, compared with 60,000 tons at this time last year.

Canada and the British Market

The Canadian Trade Commissioner in Glasgow has drawn the attention of his Government to the shortage in Scotland of most types of domestic electrical appliances of "quality manufacture." He says, however, that space heaters and irons have been plentiful for some months, although the quality is generally inferior to the comparable pre-war article. He notes particular scarcity in refrigerators, washing machines, ironers, electric kettles, toasters and other labour-saving devices, adding that the electric mixer is almost unknown. The chief electrical items imported from Canada before the war were cooking and heating apparatus, refrigerators, vacuum cleaners and washing machines. The keen interest shown in the

Dominion regarding the United Kingdom market for electrical apparatus is further exemplified by the Trade Commissioner's quotation of the results of the survey made in Enfield by the Electrical Research Association.

E.I.B.A. Meeting

The annual general meeting of the Electrical Industries Benevolent Association is to be held at 11.30 a.m. on July 24th at the Institution of Electrical Engineers, London.

Electrification of Clyde Docks

Following its recent decision to reconstruct Queen's Dock at a cost of approximately £6,000,000, the Clyde Navigation Trust has now approved a £1,000,000 scheme for the electrification and improvement of Prince's Dock.

New Zealand Imports

According to the preliminary figures of New Zealand's import trade last year the value of electrical machinery and equipment that entered the country was £3,513,000, including storage batteries, £9,000, and lamp bulbs, £53,000. In addition radio sets were imported to the value of £1,000, valves £57,000 and other wireless apparatus £180,000. In 1945, the total value of electrical machinery and equipment imported was £2,682,000 (£1,822,000 from U.K., £623,000 from U.S.A., £120,000 from Canada and £97,000 from Australia); and the total value of radio apparatus, £429,000 (£204,000 from U.S.A., £139,000 from U.K., and £67,000 from Australia). Countries of origin for 1946 are not fully available.

Australian Overseas Trade

Australian electrical imports during the nine months ended March 31st, 1947, totalled £3,485,000 in value compared with £4,082,000 during the corresponding nine months of 1945-46. Details were as follows:—

Class of Equipment	Nine months ended March	
	1946 £(000)	1947 £(000)
Batteries and accumulators ..	64	134
Cable and wire, covered ..	360	389
Dynamo-electric machines ..	815	641
Lamps, filament	136	126
Telegraph and telephone instruments, etc.	862	820
Electrical machinery and appliances	1,845	1,375
Total	4,082	3,485

During the same period Australian exports of electrical appliances and equipment were valued at £A620,000 against £A337,000.

Preserving Wooden Poles

A detailed report has been issued on tests carried out at the Forest Products Research Laboratory (D.S.I.R.), Princes Risborough, to determine the effectiveness of the salts used by Cobra Wood Treatment, Ltd., for preserving timber poles carrying overhead power lines. The salts are described as a mixture of sodium fluoride, divitrophenol and arsenious anhydride. The report outlines the method of test, names the several kinds of fungi employed and tabulates the results with beech and Scots pine sapwood. The conclusions are that "Cobra" salts are highly toxic to wood-rotting fungi, that 0·06 lb/cu ft should provide immunity from attack and that the growth of some species of fungus would be checked by somewhat weaker concentrations.

Marconi Retrospect

An attractively produced commemorative brochure has been issued to mark the fiftieth anniversary of the foundation of the Marconi organization. It focuses attention on a few of the principal events in the company's progress, commencing as a historical record of private enterprise and ending with references to achievements of the present team of associated companies which have outstripped past triumphs, however revolutionary they may have seemed to be in their day, not forgetting the concentration of effort needed to satisfy the unprecedented demands made upon the organization during two world wars.

Leicester Electrical Society

Membership of this recently formed Society is open to anyone connected with the electrical trade in Leicester, Leicestershire and Rutland. A technical and social programme is being arranged for the season 1947-48, starting in September. Particulars are obtainable from the Hon. Secretary, Mr. R. Burton, 37, Tennis Court Drive, Leicester.

Electric "Pony" Refuse Collector

One of the latest applications of the 3-wheeled battery electric "Pony" truck built by Brush Coachwork, Ltd., is for refuse collection. Ideal for this type of work where very frequent stopping and starting is necessary, this vehicle aroused great interest when shown at the annual conference of the Institute of Public Cleansing at Blackpool last month. Twelve of these vehicles have been ordered by the East Ham Public Cleansing Department.

Electricity in Hospitals

An exhibition of labour-saving devices for use in hospitals, organized on behalf of the Ministry of Health by the British Electrical Development Association with the co-operation of the British Gas Council, is being held at the Empire Tea Centre, 22, Regent Street, S.W.1. Officially opened last Monday by the Minister of Health, Mr. Aneurin Bevan, the exhibition is intended to give hospital authorities the opportunity of seeing new labour-saving and welfare equipment for their domestic staff. All exhibits are in current production. The displays include

breakfast cookers, vacuum cleaners, heavy-duty cleaner, floor scrubber and polisher, heater trolley and lift, bed pan sterilizer, food mixer, pressed-steel domestic cooker, automatic washing-up machines, milk-can sterilizers, food slicers and mincers, heated milk jugs, ice-cream makers, automatic washing and drying machines, drying cabinets, and thermostatic pressing irons. The exhibition, which will be open until August 2nd, is reserved in the mornings for hospital representatives, but the public is admitted every afternoon from 1 to 5.30 p.m.

Guernsey Ambulance Service

The ambulance service of Guernsey is provided entirely by the St. John Ambulance Brigade, and in order to secure the greatest possible expedition in the handling of calls, the Corps Transport Officer experimented with the use of radio control for the ambulances, and the G.E.C. was asked to install a v.h.f. radio system. The ambulances have direct and continuous contact with the control station, the maximum distance from transmitter to receiver in any part of the island being 6½ miles.

Consulting Engineers

The annual report of the Association of Consulting Engineers records a membership of 228, the largest in its history; 30 new members were elected during the year 1946-47 and several new South African members have joined the Association. The chairman made nominations in eighty-six cases compared with sixty-six during the previous year, in response to inquiries for the services of consulting engineers. It is hoped very shortly to announce the result of negotiations concerning fees payable by Government Departments to consulting engineers.

Reports on German Industry

Recent reports on German industry, obtainable from H.M. Stationery Office, include the following:—B.I.O.S. 1259. "Magnetics. Thermosperm and Magnetic Tachometers" (2s. 6d.). B.I.O.S. 1357. "Report on the Instrument Wire Industry and Diamond Dies in Germany" (2s. 6d.).

Dissolutions of Partnership

Messrs. C. P. Charlton and W. Orton, carrying on business as electrical engineers at 13, Yoeman Lane, Leicester, under the style of Electrical Development Co., have dissolved partnership. All debts due to and owing by the late firm will be received and paid by Mr. C. P. Charlton.

A. F. Olpin and L. Cohen, electrical contractors, trading as Elco, 34, Claremont Avenue, Bristol, have dissolved partnership.

Trade Announcements

Newey & Eyre, Ltd., electrical wholesalers have opened a new branch at 100-102, Monk Street, Derby (telephone: Derby 3057). Their chief representative there is Mr. Frank A. Cantrill, late of "Z" Electric Lamps & Supplies.

Downes & Davies, Ltd., have opened a branch at Oxford Buildings, Oxford Street, Workington, to serve the West Cumberland area.

The British Valve & Electrical Mfg. Co., Ltd., has moved to 19-25, Cropley Street, London, N.1 (telephone: Clerkenwell 7743).

The address of Alneco, Ltd., is now 115-118, Sand Pits, Birmingham, 1 (telephone: Central 3092).

Trade Publications

Cantie Switches, Ltd., Northgate Works, Chester.—Illustrated brochure (No. C.550) outlining basic features of design and reviewing the safe and economical uses of switch-fuses to safeguard distribution feeders, as isolators, or for "back-up" protection.

Acru Electric Tool Manufacturing Co., Ltd., 123, Hyde Road, Ardwick, Manchester, 12.—Leaflet describing the company's new spring winder.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, Watford By-Pass, Watford, Herts.—Illustrated pamphlet giving particulars of the company's latest furnaces for workshop use.

Campbell Engineering Co., Ltd., Sherman Works, Bromley, Kent.—Illustrated and priced leaflet (No. 11) on "Pillar" immersion heaters with installation diagrams.

Frank Whitelegg, 90, Robin Hood Lane, Sutton, Surrey.—Illustrated leaflets describing small (TM.1) and large (TM.2) coil taping machines; also usable for wrapping bars.

Arcolectric (Switches), Ltd., Edwin Road, Twickenham, Middx.—Illustrated catalogue and separate price list.

Annual Holidays

The works of the Jackson Electric Stove Co., Ltd., Clifton Road, Luton, will be closed from July 19th to 26th inclusive for annual holidays.

Measuring Instruments (Pullin), Ltd., state that their factory will be closed from July 26th until August 4th inclusive.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following :—

"Clarinator" oil-jacketed refining pan.

ELECTRICITY SUPPLY

Coventry Station Site. Widespread Tariff Reductions.

Billingham-on-Tees.—STREET LIGHTING.—Tenders are to be invited by the Urban District Council for the electric lighting of Billingham By-pass.

Birkenhead.—REMOVAL OF RESTRICTIONS.—The electrical engineer has reported that owing to progress during the past year in augmenting the distribution system it is now possible to remove most of the restrictions upon additional water heating, cooking and space heating loads, except in certain d.c. areas, but that load shedding by the Central Electricity Board might require to be continued for two or three years.

NEW STATION.—The Corporation has obtained the consent of the Electricity Commissioners to the borrowing of the sum of £1,250,000 in respect of the final extension of the power station.

Coventry.—SITE FOR NEW STATION.—A plan to use a 100-acre site owned by the Corporation to the south of the existing Longford generating station for a new station with an ultimate capacity of 200,000 kW has been approved in principle by the Electricity Committee. Detailed investigations are to be carried out at the request of the Central Electricity Board.

Croydon.—WORKS SUPPLY.—The Corporation is to give a 3-phase 150-kW supply to the Canterbury Works, Canterbury Road (£1,826).

Cupar (Fife).—STREET-LIGHTING INSTALLATION.—This burgh has recently adopted electric street lighting, using Metrovick equipment. The first street-lighting system, installed in 1830, was by gas. Now, on all the main thoroughfares Metrovick "Poplar" lanterns with 140-W sodium discharge lamps have been installed on steel poles of a simple unobtrusive design. In the side streets and closes tungsten lamp fittings are employed.

Darlington.—LOANS.—The Town Council has received sanction to borrow £7,913 for electricity meters and £2,100 for X-ray equipment at Greenbank Hospital. Sanction is being sought to borrow £18,000 for unspecified mains and services during the next three years.

Eastbourne.—HOUSING ESTATE SUPPLY.—The Corporation is to extend mains to afford a supply to housing estates at South Road, Hailsham, at an estimated cost of £932.

Farnham.—STREET-LIGHTING CONVERSION.—The gradual replacement of gas by electricity for street lighting has been approved by the Urban District Council.

Hawick.—REDUCED CHARGES.—A 25 per cent reduction in electricity charges is announced. The new lighting flat rate is 6d. instead of 8d., the heating and cooking rate being lowered from 1d. to ¾d.

Hereford.—GAS LIGHTING TO STAY.—The Corporation has considered a scheme for the lighting of main roads by electricity from which it appears that the capital charges to the Corporation would be between £40,000 and £50,000 and the annual charges for electricity and maintenance approximately £8,000. The annual charge for lighting the streets by gas amounts to approximately £3,000 and there are no outstanding capital charges. The Corporation has decided therefore to give no further consideration to the proposal to light the streets by electricity.

North Wales.—PRICE REDUCTIONS.—The North Wales Power Co., in conjunction with its associated company, Electricity Distribution of North Wales & District Ltd., has made the following reductions in electricity charges:—Flat rate, lighting, from 6d. to 5d. per kWh; residential tariff, first 100 hours' lighting, from 6d. to 5d. per kWh; maximum demand, first 600 kWh, from 3d. to 2d. per kWh. Corresponding reductions will be made to consumers taking electricity through prepayment meters, and no rental will be charged for meters and time switches.

Peterborough.—NEW TRANSFORMERS.—Four transformers for a new 11,000-V supply to the northern and southern areas, with ancillary switchgear, are to be installed at an estimated cost of £21,356.

Portland.—TARIFF CONCESSIONS.—For the year 1947-8 the war surcharge of 10 per cent on quarterly electricity accounts and two-part prepayment tariffs is to be waived and there is to be a rebate of 1½d. per kWh on flat-rate slot meter tariffs. The cost of these concessions in a full year will be about £3,500.

Preston.—STREET LIGHTING.—Lighting improvements in New Road will cost £2,565.

Scarborough.—HIGH-VOLTAGE EXTENSIONS.—The Corporation is to extend the 11-kV underground cable from the Admiralty Wireless Station, Seamer Moor Hill, to West Ayton at an estimated cost of £2,370. It is also proposed to extend the 11-kV underground cable from Woodland Ravine substation to Newby substation, and the switchgear in these substations, at an estimated cost of £1,630.

LOAN FOR SUBSTATIONS.—Application has been made by the Town Council to the Electricity Commissioners for sanction to borrow £11,174 for substation buildings, switchgear and mains.

Torquay.—STANDING CHARGES.—By twenty-seven votes to six the Town Council at its last meeting passed a resolution moved by Alderman Langdon which instructed the Electricity Committee to explore the possibility of reducing the present standing charges by 5 per cent.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Thomas Bolton & Sons, Ltd., report a profit for the year ended March 31st amounting to £183,551 (£30,035) after deducting taxation, depreciation £60,000 (£50,000), interest on debentures £17,015 (£17,230) and directors fees £4,375 (£3,599). After providing for income tax on 1946-47 profits £126,464 (£21,150) less adjustment for previous year £22,386 (£11,711), it is proposed to pay a final dividend of 5 per cent, making 7½ per cent for the year, plus a bonus of 2½ per cent. The dividend for 1945-46 was also 7½ per cent but no bonus was paid. The balance carried forward is £72,625 (£68,699). In his report the chairman, Mr. P. V. Hunter, says that the increased demand has been maintained throughout the year and there was still plenty of work available. The effect of the five-day week has still to be determined and the world-wide shortage of raw materials has forced prices up to unnaturally high levels.

The Automatic Telephone & Electric Co., Ltd.—In a statement circulated with the annual report the chairman, Sir Alexander Roger, states that in spite of difficulties and delays the company has succeeded partially in providing new machinery and equipment. In addition a small factory has been bought in the Liverpool area which would help the increased output required during the next few years for home and export trade. Output for 1946 was the largest the company had ever had in peacetime. The consolidated net profit for 1946, before allowing for income tax, amounted to £250,182, as compared with £282,747 for 1945. The total consolidated assets have risen from £4,177,762 to £4,347,752. Capital reserves total £376,723 (£178,252), while total revenue reserves amount to £708,054 (£692,088). Current liabilities and provisions are lower at £1,886,510 (£1,905,964).

The Chloride Electrical Storage Co., Ltd., announces a rise in profit from £439,928 in 1945-46 to £761,430 last year, after meeting E.P.T., etc. The net profit, after charging income tax, was £297,646, against £196,952. The allocations include £100,000 (against nil) to general reserve and £23,000 (£10,000) to subsidiaries' pension scheme. A sum of £10,873 from the sale of a subsidiary's fixed assets is applied to the writing down of shares in subsidiaries. The dividends on the "A" and "B" capital are maintained at 20 per cent and the amount carried forward is £213,847 (£171,877).

Consolidated profits are given as £964,322 and income tax as £572,067. It is proposed to change the accounting period to the calendar year and the next accounts will cover the nine months to December 31st this year.

W. T. Henley's Telegraph Works Co., Ltd., reports a balance of £663,482 for the year ended December 31st last, as compared with £582,829 for the previous year. After deducting income tax £274,406 (£273,294), depreciation £94,973 (£85,849), directors' fees £8,750 (same) and auditors' fees £1,800 (£1,500), there remains a profit of £253,553 (£213,436). A sum of £75,000 is again transferred to the post-war contingencies reserve account, while £10,000 (nil) goes to the staff pension fund. A final dividend of 10 per cent with a cash bonus of 5 per cent maintains the total distribution at 20 per cent, leaving £413,822 (£393,219) to be carried forward.

The consolidated profit and loss account of the company and its subsidiaries (including income from investments and after providing for E.P.T. overseas taxation, bad debts and contingencies) shows a balance of £728,928. With income tax taking £264,185, depreciation £120,235, directors' fees £12,250 and auditors' fees £2,126, the profit is £330,132. The carry-forward is increased from £480,370 to £577,552.

W. & T. Avery, Ltd., report a net profit of £202,067 for the year ended March 31st last, as compared with £147,119 in the previous year. A sum of £50,000 is again reserved for reconversion and development and a similar sum (nil) goes to research. No contribution is made to general reserve, which last year received £20,000. In addition to receiving a final dividend of 10 per cent (same), a bonus of 5 per cent (nil) is to be paid, making 20 per cent (15 per cent) for the year. A sum of £71,261 (£71,295) is carried forward.

The Mexican Light & Power Co., Ltd.—At the annual general meeting held recently in Toronto, Mr. E. A. Gradiom read a statement prepared by Mr. Henri Speciael, the chairman of the company who is now in Europe. Mr. Speciael said that the abnormal conditions created by the war had provided an enormous impetus to the extraordinary industrial development in Mexico. During 1946 sales increased by 82·5 million kWh, or 8·5 per cent, while during the first four months of 1947 they had increased by 48 million kWh over the corresponding period of 1946. Considerable plant extensions were in hand.

Herbert Terry & Sons, Ltd., report a balance for 1946 amounting to £89,381 (£70,498), after providing for taxation, etc., other income bringing the total to £95,596 (£80,466). The net profit was £82,419 (£66,968). A final dividend of 1s. per share is to be paid, making 1s. 6d. or 30 per cent (against 35 per cent including 5 per cent bonus).

Ultra Electric Holdings, Ltd.—The accounts for the nine months to March 31st last show a dividend from Ultra Electric, Ltd., of £20,000;

this with £665 tax recovered gives a total of £20,665 (against £17,177 for the preceding full year). The ordinary dividend is 12½ per cent (against 10 per cent).

Allen West & Co., Ltd., report an increase in gross profit from £95,873 to £180,662 for the past year. Added to this are additional trading profits relating to previous years £45,862 (nil), dividends and interests on investments in subsidiaries £5,757 (same) and E.P.T. estimated net recovery nil (£16,000), making £231,281 (£117,630). Taxation requires £104,043 (£21,677) and depreciation £20,000 (£10,000), and there is a net profit of £88,373 (£47,771). A sum of £20,359 (£15,000) is placed to reserve and a dividend of 7½ per cent (same) plus a bonus of 2½ per cent (nil) is to be paid, leaving £91,445 (£56,947) to be carried forward.

Philips' Incandescent Lamp Works Holding Co., in its first post-war report covering the period May 1st, 1945 to December 31st, 1946, reports a net profit of Fls.7,217,755. A dividend of 6 per cent is to be paid for the year both on preference and ordinary shares, making 10 per cent for the 20-months period. It is expected that there will be a further material rise in production and exports with more favourable financial results for 1947.

The Ship Carbon Co. of Great Britain, Ltd., is to maintain the ordinary dividend for the seventeen months to December 31st last at the rate of 10 per cent per annum. The net profit for the period was £110,831, against £78,321 for the year to July 31st, 1945. The allocations include £20,000 to general reserve (against £4,482).

Walsall Conduits, Ltd., announces a profit of £230,707 for the past year, before providing for taxation, as compared with £127,722 for 1945. In addition to a final dividend of 35 per cent, a bonus of 15 per cent is to be paid, making the total distribution 70 per cent, against 55 per cent.

The West of England Electric Investments, Ltd., which is controlled by Whitehall Investments, Ltd., had an income of £101,329 for the year ended March 31st, last, as compared with £102,107 for the previous year. The dividend is to be maintained at 8 per cent and £54,803 (£48,184) is carried forward.

The Oriental Telephone & Electric Co., Ltd., states that it has been found impossible to complete the accounts in time for the annual meeting on July 29th at which an adjournment will be moved. It is proposed to convert the issued ordinary shares into £1 units.

The Ebonite Container Co., Ltd., reports a net profit of £18,463 (£14,902). A dividend of 12½ per cent (12 per cent) is to be paid, making 17½ per cent (17 per cent).

Hoover, Ltd., in declaring an interim dividend of 10 per cent (against 5 per cent) state that this increase does not indicate a larger distribution for the year.

Telephone Rentals, Ltd.—To enable the company to deal with new business, 800,000 5s. ordinary shares are being offered to shareholders at 12s. 6d. per share in the proportion of one new share for every four held.

The **Great Northern Telegraph Co.'s Holding Co., Ltd.,** proposes to distribute for the year ended June 30th a dividend of 13 per cent and to carry forward Kr.2,415·99.

The British Vacuum Cleaner & Engineering Co., Ltd., has declared a dividend of 20 per cent for the past year (same).

Hick, Hargreaves & Co., Ltd., are again to pay a dividend of 8 per cent, making 10 per cent (same) for the year.

New Companies

Dixons (Derby), Ltd.—Registered June 2nd. Capital, £3,000. Wireless and electrical engineers and contractors, etc. Directors: G. Dixon and Mrs. Doris I. Dixon. Regd. office: 115, Normanton Road, Derby.

Hillman Electrical, Ltd.—Registered June 6th. Capital, £500. Directors: E. W. Ward and L. J. A. Hillman. Regd. office: 36, Church Lane, East Finchley, N.2.

Loheat Frame Co., Ltd.—Registered June 6th. Capital, £5,000. To acquire the business of electrically heated garden frame manufacturers carried on by S. Brooks, C. H. Breguet and A. G. Billington at Eddington, Hungerford, Berks, as the Loheat Frame Co. Directors: S. Brooks, C. H. Breguet, and A. G. Billington. Regd. office: 20, Northbrook Street, Newbury, Berks.

Liquidations

Farrs Wholesale (Midlands), Ltd., electrical dealers, Church Street, Rugby, and at Derby and Peterborough.—The statutory meeting of creditors was held recently at Rugby. It was decided that the voluntary liquidation of the company should be continued with Mr. R. F. Bendall, of Messrs. Poppleton & Appleby, Exchange Buildings, New Street, Birmingham, as liquidator.

Mechanism, Ltd. (old company).—Claims by July 31st to the liquidator, Mr. H. Darrell, 1, High Street, Croydon.

Frank Murphy of London, Ltd.—First meetings July 11th at the Bankruptcy Buildings, Carey Street, London, W.C.2.

Electric & Musical Industries (China), Ltd.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. S. F. Shuttleworth, 38, Lombard Street, London, E.C.3.

Bankruptcies

D. W. J. Prentice, 59, Brecon Road, Fulham, London, S.W., electrical engineer.—First and final dividend of 2s. 3½d. in the £, payable July 18th at Bankruptcy Buildings, Carey Street, London, W.C.2.

MOTORS
GENERATORS

CONTROL GEAR
AIR BREAK
OIL IMMERSED
HAND OPERATED
AUTOMATIC

SWITCHGEAR
SWITCHES
FUSES
SWITCHBOARDS
AIR BREAK
OIL IMMERSED

FANS
CEILING
DESK and
BRACKET
VENTILATING

LIGHTING FITTINGS
GAS FILLED
DISCHARGE

OF IMPORTANCE TO YOU

In order that we may give you the best service under the present difficult conditions we appeal to you to utilise standard equipment, ratings, etc., whenever possible. Your co-operation in this respect will enable us to concentrate on standard production with consequent reduction in despatch time.

USE "STANDARD"

VERITYS Ltd.

Sales Headquarters : **BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2**
Works : ASTON, BIRMINGHAM 6

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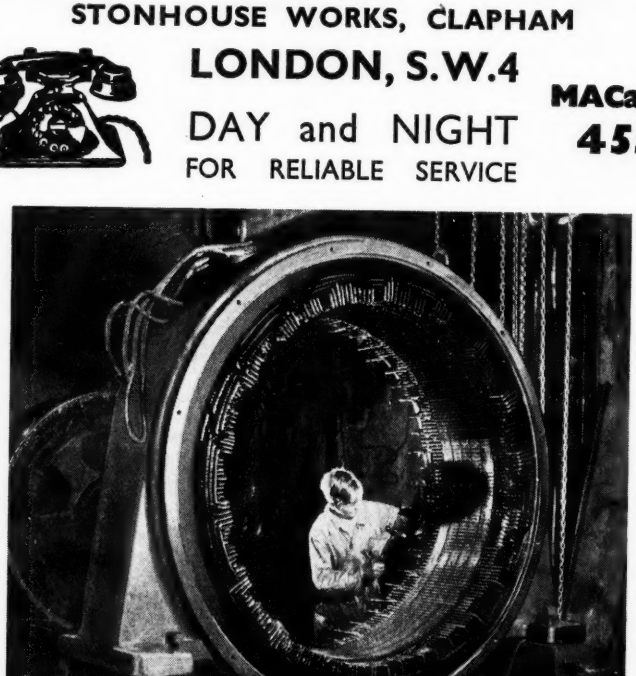
STONHOUSE WORKS, CLAPHAM

LONDON, S.W.4

DAY and NIGHT
FOR RELIABLE SERVICE

MACaulay 4555



STATOR OF AUTO-SYNCHRONOUS MOTOR REWOUND AT OUR WORKS

WE REPAIR · REWIND · REDESIGN A.C. and D.C. MOTORS · ALTERNATORS · ROTARY CONVERTERS CONTROLLERS

NOTHING TOO SMALL — NOTHING TOO LARGE

WE COLLECT AND DELIVER

Established over 35 years

STOCKS AND SHARES

STOCK Exchange markets have suffered a severe decline in prices, and falls from the recent high levels have been substantial in many cases. Half a dozen reasons can be adduced to account for the depression. The principal is the failure of the Paris Conference to achieve European unity, added to which there is the growing impression, already mentioned here, that the Government may not be able to maintain its cheap money policy.

Holders of Central Electricity Board stocks have been able to watch the slump in other gilt-edged prices with relative indifference. Prices at which the stocks are intended to be taken over are fixed by the terms of the Electricity Bill, but the compensation stock to be given in exchange will be issued in accordance with gilt-edged conditions ruling at the time. An intervening fall of gilt-edged prices implies, consequently, the receipt eventually of a larger amount of compensation stock, or a higher rate of interest upon it. C.E.B. stocks remain, however, at several points discount on the estimated take-over prices. The 4½ per cent 1951/73 stock, recently quoted ex the June interest payment, is 3½ points below the estimated compensation value of 108¼. On the 5 per cent stock 1955/75 at 114⅞, the discount is 2¼ points; the next interest is due in October. Regardless of logic the prices of the Board's various issues have mostly lost about a point since a week ago.

The Ebbing Tide

The list of Home electricity supply shares shows its customary resistance to the elements that have made for depression in other markets round the House. Apart from a fall of 1s. 6d. to 43s. 6d. in Scottish Power ordinary, no quotable changes have occurred. Amongst overseas issues, Victoria Falls are down 2s. 6d. at 5⅞. Tokyo sixes lost two points at 35½. In other directions, falls range from 6d. to 5s., the latter being marked against De la Rue, 62s. 6d., Decca, 53s. 9d., and Tube Investments 6¾. Declines of 2s. 6d. left Murex at 95s. and Reyrolle at 83s. 9d. Amongst other falls, British Vacuum Cleaners at 22s. are 1s. 9d. lower. British Aluminium, 49s. 6d., and H.T.A., 19s., have gone back 1s. each. Thomas Tillings at 65s., and British Electric Traction deferred, at 1350, are down by 1s. and 25 points respectively. Marconi Marines gave way to 32s., Oriental Telephones to 53s. 9d. The Automatic Telephone report hints at a possible further issue of capital in the future, and the price of the shares has eased off to 73s. 9d.

Matters of Moment

After this sombre recital it is something of a relief to report that Ever Ready, at 42s. 6d., London Electric Wire, 51s., and British Thermostat, 26s. 6d., show modest improvements. Telephone Rentals are 14s. ex the rights to apply for two new shares in respect of every seven old, at 10s. The new shares are quoted at about the same price as the old. The General Electric dividend announcement will probably be issued before this number, and repetition of the previous 17½ per cent is generally expected. The company pays its ordinary dividend only once a year, so the current 98s., about 1s. 6d. down on the week, includes a probable 3s. 6d., less tax, dividend. The board has a long-established reputation for being cautious and conservative in its financial policy. Cable & Wireless stocks are unusually quiet on the week, the ordinary at 157½ is 3½ points down.

Company Results

Allen West's full accounts show an expansion in the trading profit from £96,000 to £180,700 and confirm the rise of £40,000 to £88,300 in the final net figure. The shares are quoted at 10s. 6d., ex the 7½ per cent dividend and the 2½ per cent bonus by which last year's distribution has been increased. On the total of 10 per cent the yield works out at £4 17s. 6d. per cent. The profits represent earnings of 20 per cent on the ordinary capital, increased to £590,000 by the issue of nearly half a million shares at 7s. 6d. a year ago. By this issue the company eliminated the outstanding debenture stock, the only prior charge before the ordinary capital.

Walsall Conduits' profit made a remarkable advance last year and the addition of a 15 per cent bonus raises the total distribution from 55 to 70 per cent.

A. C. Cossor's final distributions, declared at the end of last month, were much in accordance with the forecast made earlier in the company's interim report. Excluding the special tax-free 7 per cent bonus, the total payment of 25 per cent is equivalent to 13¾ per cent net and compares with last year's tax-free dividends of 12½ per cent. At 25s. 6d. the shares are down on the week, and more than £1 below this year's best price. They now show a yield of practically 5 per cent gross. Other radio shares have lost ground this week.

Ward & Goldstone

This company's 5s. shares have been a noticeably good market since the declaration of the 30 per cent final dividend, which made a total of 50 per cent for the year ended last March. Having risen this year from 50s., the present price is 63s. x.d. and the yield £3 19s. 4d. per cent. After paying 20 per cent during the war, the company raised its distribution to 25 per cent in 1945 and to 35 per cent last year. Dividend policy has been consistently conservative, with the result that last year's balance-sheet showed reserves and surplus of over £200,000 in support of the issued ordinary capital of £94,300: trading profits for the year just ended are stated to be £263,000, or £50,000 above the previous figure, and net profit has more than doubled at £128,200. Despite the dividend increase, therefore, a large proportion of the profits has evidently been retained in the business.

Remarkable Recovery

Bulpitt & Sons Again in Full Production

FEW makers of domestic electrical appliances can have been more seriously hit by the war than Bulpitt & Sons, Ltd. In 1940 most of their Swansea Works in Camden Street, Birmingham, was destroyed by bombing, together with all the special tools, jigs and machinery. Three dispersal factories in various parts of Birmingham enabled the company to make its contribution to the war effort by the production of such items as torpedoes, sea markers, smoke floats, identification flares, photographic flashes, practice bombs, bulkhead lamps, Admiralty stores and equipment, etc. It was possible, however, to do a little on the domestic side by supplying a very limited number of electric kettles and replacement elements.

With the cessation of war contracts, the company was therefore at a very serious disadvantage and had practically to restart from scratch to get its "Swan Brand" products on to the market again. Now, however, after two years' hard work it is able to congratulate itself on having in production once again in large quantities practically all its pre-war lines, as well as several new models.

St. George's Works in Icknield Street, which was taken over early last year, is engaged entirely on electrical appliances, particularly kettles. At the moment production of these is concentrated on the popular standard model, which is now available in polished or chromium-plated copper, anodized aluminium or speculum plate. Further kettles of attractive post-war design will be introduced when conditions permit. Also made at this works are coffee percolators, in electroplated copper, and thermostatically controlled irons, features of which are an anodized aluminium soleplate, comparatively low loading (600 W), chromium or vitreous enamel finish, illuminated dial and a comfortable bakelite grip.

At the company's Swansea Works which is still being rebuilt, various types of fires both of the most popular pre-war and new designs are being made, together with a full range of heavy ground-base aluminium utensils specially made for hotplate cooking. A third factory in Clissold Street is used for the production of non-electrical aluminium ware. Bulpitt & Sons are exporting ten times their pre-war volume, or the equivalent of about half of their production.

Above: Inspecting and packing electric kettles for dispatch
Left: Testing the automatic plug ejector incorporated in the kettle elements

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1943

WESTINGHOUSE Brake & Signal Co., Ltd.—" Remote control systems." 2460. August 21st, 1942. (589332.)

1944

J. U. Birnie.—" Insulating coating and methods of applying the same." 2980. February 17th, 1944. (589386.)

Allmanna Svenska Elektriska Aktiebolaget.—" Direct current saturable inductance transductor with self-magnetization." 4698. March 26th, 1943. Cognate application 4699/44. (589341.)

Allmanna Svenska Elektriska Aktiebolaget and G. Bengtsson.—" Electrical measuring apparatus for resistance welding machines." 15215. August 10th, 1944. (589438.)

C. H. Shearman.—" Apparatus for treating gases with electric discharges." 5090. October 23rd, 1946. (589284.)

H. E. Hutter.—" Magnetic filters for liquids." 9046. May 12th, 1944. (589387.)

A. H. Human.—" A.c. electrical heating of rod-like blanks for the manufacture of headed bolts or the like." 10466. May 31st, 1944. (589435.)

R. T. Drever.—" Power-driven machine for use as a kitchen accessory in carrying out mixing, mincing, grating, and other operations." 11066. June 9th, 1944. (589491.)

Tobe Deutschmann Corporation.—" Method of adjusting capacitors to fixed capacity valves." 13127. November 30th, 1943. (589289.)

F. B. Dehn (Adel Precision Products Corporation).—" Electric conduit supporting and bonding block." 13138. July 10th, 1944. (589290.)

Sperry Gyroscope Co., Inc.—" Measurement of the phase difference between two alternating electrical quantities." 13734. June 28th, 1943. (589493.)

Begwaco, Ltd., and E. Butterworth.—" Prepayment mechanism of meters." 13993. July 23rd, 1945. (Addition to 568581.) (589486.)

Standard Telephones & Cables, Ltd.—" Arrangements for measuring high-frequency electric power." 14445. July 31st, 1943. (589291.)

Aktiebolaget Ljungstroms Angturbin.—" Turbines." 16138. August 24th, 1943. (589294.)

Mullard Radio Valve Co., Ltd., and A. M. Spooner.—" Saw-tooth oscillation generators." 16954. September 5th, 1944. (589439.)

British Thomson-Houston Co., Ltd.—" Electron accelerator control systems." 17138. September 10th, 1943. (589348.)

F. B. Dehn (Adel Precision Products Corporation).—" Wire supporting clip." 18923. October 3rd. (589391.)

W. W. Triggs (Photoswitch, Inc.).—" Photoelectric control." 19699. October 12th, 1944. (589300.)

Philips Lamps, Ltd.—" Frequency detecting systems." 20775. October 27th, 1943. (589496.)

M. Pandel.—" Electromagnetic measuring apparatus." 21162. October 29th, 1943. (589442.)

British Thomson-Houston Co., Ltd., and C. W. Wood.—" Lampholders of Edison screw type." 23780. February 18th, 1946. (589357.)

F. Tench (Automatic Electric Laboratories, Inc.).—" Electrical signalling systems." 23892. November 30th, 1944. (589358.)

Marconi's Wireless Telegraph Co., Ltd.—" Electron discharge tube reactances." 23993. December 1st, 1943. (589303.)

Marconi's Wireless Telegraph Co., Ltd.—" Electrical frequency dividing circuit arrangement." 25802. December 24th, 1943. (589361.)

1945

C. Arnold (Therma Electric Heating Manufacturing Co., Ltd.).—" Apparatus for electrode cooking and heating." 1337. January 16th, 1945. (589363.)

O. Abisch.—" Cable drums." 2411. January 31st, 1945. (589316.)

G. M. Horvitch.—" Electric burglar-alarm." 2431. January 31st, 1945. (589369.)

Maschinenfabrik Oerlikon.—" Electric circuit breakers containing quenching liquid." 2914. February 4th, 1944. Cognate applications 2915/45, 2916/45 and 2917/45. (589318.)

F. B. Dehn (Adel Precision Products Corporation).—" Wire supporting clip." 2995. February 6th, 1945. (589395). " Wire supporting clip." 2996. February 6th, 1945. (589319.)

Aktiebolaget Elektrolux.—" Absorption refrigerating apparatus." 3679. March 3rd, 1944. Cognate application 3680/45. (589373.)

Bio Electrics, Ltd., and H. J. Osborn.—" Electric heating elements." 4491. February 22nd, 1945. Cognate application 19485/45. (589322.)

W. W. Constantine (General Motors Corporation).—" Clothes washing machine." 4675. February 24th, 1945. (589374.)

Standard Telephones & Cables, Ltd.—" Variable electric condenser." 5243. March 15th, 1944. (589376.)

E. G. L. Roberts.—" Device for deforming the ends of metal sheathed electric cables." 5794. March 8th, 1945. (589326.)

Marconi's Wireless Telegraph Co., Ltd.—"Voltage supply circuits." 6217. March 13th, 1944. (589327.)

Landis & Gyr Soc. Anon. — "Stopper circuits." 6263. March 22nd, 1944. (589454.)

Plessey Co., Ltd. — "High-frequency vibrator." 6372. April 14th, 1944. (589455.)

Aldis Bros., Ltd., and A. C. W. Aldis.—"Air valves, applicable to the cooling of mercury vapour and other gas discharge lamps." 6879. March 19th, 1945. (589460.)

Lumalampan Aktiebolag. — "Electric discharge tube." 7104. July 12th, 1943. (589467.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Sweep circuits for producing saw-tooth waves." 7203. March 21st, 1945. (589407.)

British Insulated Cables, Ltd., W. C. Handley and J. C. Quayle.—"Electric condensers." 7244. March 22nd, 1945. (589412.)

British Thomson-Houston Co., Ltd., and C. Stewart. — "Automatic voltage regulators." 7275. March 22nd, 1945. (589418.)

Evershed & Vignoles, Ltd., and W. T. Marchment.—"Electrical remote indicating or repeating systems." 7304. March 22nd, 1945. (589423.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Oscilloscopes." 7318. March 22nd, 1945. (589427.)

Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker.—"Telephone or like systems." 7327. March 23rd, 1945. (589469.)

F. Neumann.—"Electrical measuring instruments." 7409. March 23rd, 1945. (589518.)

F. W. Rutter.—"Electric wiring systems and apparatus." 7484. March 24th, 1945. (589524.)

D. P. Alexander, B. J. Williams and R. L. A. McKenzie. — "Control of electric supply systems." 7499. March 24th, 1945. (589474.)

D. P. Alexander.—"Alternators." 7500. March 24th, 1945. (589526.)

W. Edwards & Co. (London), Ltd., J. W. Tills and F. C. Potts.—"Fluid stream vacuum pumps." 7532. March 26th, 1945. (589475.)

Marshall, Sons & Co., Ltd., and S. H. Richards.—"Apparatus for winding wire or the like." 7545. March 26th, 1945. (589529.)

A. G. Kettle.—"Lamp and shade-locking devices for electric lamp couplings." 7650. March 27th, 1945. (589430.)

D. O. Burns and W. H. H. Kelk.—"Electromagnetically operated timing mechanisms." 7776. March 27th, 1945. (589478.)

H. E. Holman.—"Connectors for joining of braided electric cables." 7893. March 28th, 1945. (589432.)

F. Heaton, F. R. Heaton and A. M. Woodley.—"Push-button devices for use in controlling electric circuits." 8109. March 30th, 1945. (589483.)

F. Heaton, F. R. Heaton and A. M. Woodley.—"Contact assemblies for drum type electric switches." 8111. March 30th, 1945. (589484.)

Trade Marks

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month from the dates shown:—

June 25th

METREX. Class 6. No. 639,992. Tungsten wire and molybdenum wire (none being insulated or fuse wire) and bi-metal strips, rods or bars consisting of two common metal elements.—Allied Metals, Ltd., 62, London Wall, E.C.2.

SMOO-IE. Class 9. No. 646,200. Electric flat irons.—Christopher Kerr, "Oak Lea," Wallhill Lane, Brownshill Green, Allesley, nr. Coventry.

ARIA. Class 9. No. 647,911. Radio receiving apparatus.—Aeronautical & General Instruments, Ltd., Purley Way, Croydon.

ACOUSTILUX. Class 9. No. 647,928. Wireless apparatus.—E.J.C.S. St. J. Chesney, trading as the Motovia Co., Francis Works, Attenbury Lane, Timperley, Ches.

MAGICURB. Class 11. No. B646,501. Electric fires (complete) and electric radiators (complete).—A. E. Taylor, 51, Weald Road, Hillingdon, Mx.

ZOORAY. Class 11. No. 647,405. Electric fires.—J. R. Thomas, "Woodville," 245, Chase Side, Southgate, N.14.

July 2nd

ARW (design). No. B643,101, Class 9. Electrical, magnetic and electronic apparatus and appliances, all included in Class 9; scientific apparatus and appliances, etc.—Atkins, Robertson & Whiteford, Ltd., 100, Torrisdale Street, Glasgow, S.2.

MARANDA. No. 645,113, Class 9. Electrical apparatus, instruments and appliances, and parts thereof, none being included in other classes, but not including electric cables or electric wires.—M.R.D.A., Ltd., Maranda House, Binney Street, Oxford Street, London, W.1.

MINDUS. No. 647,843, Class 11. Apparatus for lighting, heating, cooking, refrigerating, drying and ventilating.—Midland Industries, Ltd., Heath Town Works, Deans Road, Wolverhampton.

DEMOCRAT. No. 648,085, Class 11. Hair-drying appliances and parts thereof not included in other classes.—Salon (Nelson), Ltd., Holin Bank, Nelson, Lancs.

SILEX. No. 648,112, Class 11. Electric, etc., stoves.—Silex Household Products, Ltd., 99a, Park Lane, London, W.1.

MAVIS. No. 648,218, Class 11. Apparatus and installations for heating, cooking, drying, refrigerating, water supply, etc., and parts thereof not included in other classes.

LECTIM. No. 646,815, Class 14. Electric clocks.—H. H. Lee, The Manor, Waterrow, near Wiveliscombe, Somerset.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bathavon. — July 22nd. R.D.C. Two electrically driven water-pumping sets. Deposit: £2 2s. Particulars from Willcox, Raikes & Marshall, engineers, 33, Great Charles Street, Birmingham, 3.

Burnley.—July 14th. Electricity Department. E.h.v. cable. (June 27th.)

Cumberland.—July 14th. County Council. Electrical installation, Aspatria Council School. (July 4th.)

Darlington.—July 16th. Electricity Department. Overground feeder pillars and underground disconnecting boxes. (July 4th.)

Dorset.—The County Council invites contractors and manufacturers to apply for consideration in respect of work and materials for building and maintenance works. Applications are to be submitted by July 31st. (June 27th.)

Dundee.—July 21st. City Electricity Department. Automatic CO_2 fire extinguishing equipment for a 33-kV substation. (June 27th.)

August 13th. Corporation. Multicore h.v. and l.v. cables. (See this issue.)

Halifax.—August 18th. Borough Council. 33-kV underground cables and 33-kV metalclad switchgear and control panels. (July 4th.)

Hebden Bridge.—July 26th. Joint Sewerage Board. Equipment of two electric pumping installations. Particulars from the manager, Sewage Purification Works, Redacre, Mytholmroyd, near Halifax.

Hornsey.—July 28th. Borough Council. Electrical installations in 116 flats, "Hillcrest," North Hill, Highgate. (July 4th.)

Iraq.—Crown Agents for the Colonies. Diesel-driven generator sets. (June 27th.)

Kirkcaldy.—July 28th. Town Council. Electrical work at extensions to the Forth Park Maternity Hospital. Particulars from the architects, W. Williamson & Hubbard, Royal Bank Buildings.

Newport (Mon.).—July 31st. Corporation. 33-kV main and pilot cables. (June 27th.)

Orders Placed

Glasgow.—Corporation. Accepted. Supply and erection of one 120-ton and one 12-ton overhead electric travelling cranes (£15,625).—Sir William Arrol & Co.

Ilford.—Electricity Committee. Recommended. Auxiliary cables from the Clark's Road substation to the Uphall substation (£23,514).—B.I. Callender's Cables.

Liverpool.—Corporation Water Committee. Recommended. Plant and materials, including rotary convertor, transformers and switchgear, and transmission lines for supply to Abertridwr, Lake Vyrnwy.—G.E.C.

Manchester. — Electricity Committee. Accepted. Annual contract for house-service units.—Parmiter, Hope & Sugden; British Insulated Callender's; Reyrolle.

Accepted. Wire, double cotton and rayon covered.—Pirelli-General; British Insulated Callender's. Wire, tinned bare copper.—Rd. Johnson & Nephew. A.c. motors.—B.T.H.; Electric Construction Co.

Newcastle-on-Tyne.—City Council. Accepted. 50-kW impulse reaction turbine for the Rutherford College of Technology (£3,355).—C. A. Parsons & Co.

Education Committee. Accepted. Electrical installation in additional classrooms at Todd's Nook Primary School (£112).—Falconar, Cross & Co.

South Shields.—Town Council. Accepted. Rewiring of the Mortimer Road School (£1,211).—Steels Engineering Installations.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrhead (Renfrewshire).—Sewage works (£116,673); town clerk.

Batley.—Secondary school (£251,700); borough surveyor, Brunswick Street.

Bedford.—"Orlit" houses (60), Harrowden Road (£73,560), for T.C.; Kirk & Kirk, builders, 287, Upper Richmond Road, Putney, S.W.15.

Bexhill-on-Sea.—Houses, Watermill Lane (28) and Ingrams Farm estate (14); Bexhill Building Trade Employers' Association, High Street.

Blyth.—Miners' houses (50), Bebside; borough engineer.

Bradford.—Extensions, Woodhouse Grove School (£50,000); William Irwin & Co., builders, 2, Burley Street, Leeds, 3.

Brighouse.—Extensions, Brookfoot Biscuit Works for Meredith & Drew, Ltd.; Taylor, Roberts & Bowman, architects, 10, Clegg Street, Oldham.

Bury.—Ice-cream factory, Hornby Street; Parker & Calvert, builders, Pine Street, Heywood.

Carlisle.—Extensions, St. Patrick's R.C. Schools; E. Anderson, builder, 54, Upperby Road.

Catterick Camp.—Houses (244) for married soldiers; F. W. Shephard Bros., builders.

Chesterfield.—Houses (60), Shirland, Beighton and Eckington; J. B. Wikeley, Rural Council House.

Coulsdon.—Flats (25) and houses (17), Netherne estate; county architect, County Hall, Kingston-on-Thames.

Darlington.—Houses (50); Tarran Industries, Ltd., contractors.

Dartford.—Factory, Watling Street; Clark & Land, Ltd., 8, Warner Yard, Warner Street, E.C.1.

Deal.—Bungalows (100), Park Road, Addelam and Owen Square sites; J. L. Sharratt, borough surveyor, Municipal Offices, Queen Street.

Durham.—Houses (110), Sunderland Road estate; city engineer, Town Hall.

Egremont (Cumberland).—Houses (60) for the North Eastern Housing Association, Metrovick House, Northumberland Street, Newcastle-on-Tyne; R. Brown, architect.

Fareham.—Houses (44), Mays Lane, Stubbington; U.D.C. surveyor, Westbury Manor.

Gateshead.—Extensions for Northern Coachbuilders, Ltd., and also for the Bushing Co., Ltd., Team Valley estate; Cackett, Burns Dick & MacKellar, 21, Ellison Place, Newcastle.

Hartlepool.—Harbour extensions and improvements, for L.N.E. Railway Co. (£350,000).

Hebburn-on-Tyne.—Additions and improvements, Wailes Dove Bitumastic Co.'s works (£36,000); C. Brims & Co., Ltd., Pandon Buildings, City Road, Newcastle-on-Tyne.

Helmshore (Lancs).—Research laboratories: Textile Machinery Makers, Ltd., 60, Hursfield Road, Oldham.

Hereford.—Primary school, Hunderton (£60,000); W. Usher, county architect, County Offices.

Hove. — Houses (94); borough surveyor, Town Hall.

Kidderminster.—Houses (30), Wolverley and Chaddesley Corbett; A. S. Northover, R.D.C. surveyor, Land Oak House.

Kirkcaldy.—Miners' houses (300), Sauchenbush; burgh surveyor, East Fergus Place.

Electrical work, Forth Park Maternity Hospital extensions; Wm. Williamson & Hubbard, architects, Royal Bank Buildings.

Laindon.—Factories, Dovercourt Avenue site; Billericay Developments, Ltd., 44, Bedford Row, W.C.1.

Lichfield.—Factory extensions for John Harris (Coventry), Ltd., Greenhough Road.

Manchester.—Extensions, bakery, Skerton Road, for W. J. Brookes & Son, Ltd.; W. Thorpe & Son, Ltd., builders, Chester Road.

Netherton.—Houses (62), for West Lancashire R.D.C.; Sefton Building Co., Ltd., Aintree, Liverpool, 9.

Newport (I.O.W.).—Workshop, laboratory, administrative and store blocks, boiler house, etc., County Technical College (£120,000); county architect.

North Westmorland.—Houses (44) for R.D.C.; A. Knewstubb, architect, St. Andrew's Chambers, Penrith.

Omagh (Co. Tyrone).—Factory; Ministry of Commerce.

Paisley.—Complete renovation of electrical plant for William Fulton & Sons, Glenfield.

Plymouth.—Factory, Marsh Mills; Tecalemit, Ltd., Great West Road, Brentford.

Preston.—Government factory; Herbert Joyce & Sons, Martins Bank Chambers, Clifton Street, Blackpool.

Rotherham. — Factory, Eastwood Trading estate; Dorothy Perkins, Ltd.

Roxburgh.—Sewage works, Hawick and Jedburgh; county clerk, Hawick.

Scarborough.—Housing schemes, Seamer; F. Shepherd & Sons, York, and Frank Haslam, Ltd., Doncaster, builders.

Seaham.—Houses on 60-acre site west of Stockton Road, and also miners' houses (160); A. M. Smith, U.D.C. surveyor.

Sedgefield. — Aluminium houses (1,000); R.D.C. surveyor.

Sheffield.—Infants' school, Monteney Crescent, Parson Cross (electrical work), for West Riding C.C.; county architect, Balne Lane Offices, Wakefield.

Sittingbourne. — Houses (120), Canterbury Road estate; borough surveyor, Council Offices.

Stirling. — Reconstruction, Albert Hall (£37,000); burgh surveyor.

Stockton-on-Tees.—Factory for the Hugill Forge & Engineering Co., Ltd.; Wintersgill, Ltd., builders, Skinner Street, Stockton.

Stone (Staffs).—Houses (120), Barlaston and Blythe Bridge; surveyor, R.D.C. Offices.

Surrey.—Houses and flats, Netherne and Botley Park estates (£102,353); county architect, County Hall, Kingston-upon-Thames.

Tees-side.—Oil and coal berths (£340,000); Tees Conservancy Commission, Middlesbrough.

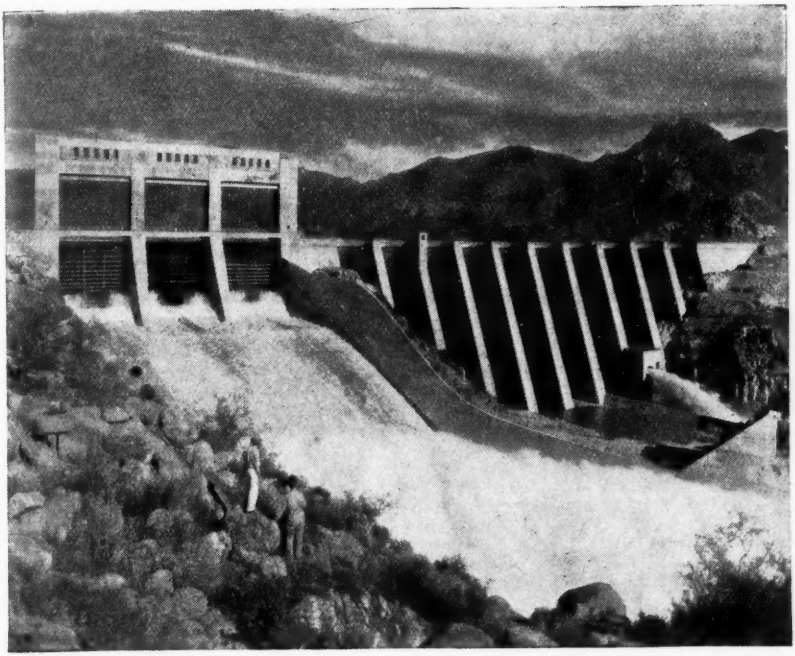
Treorchy.—Government factory; Gee, Walker & Slater, Ltd., Mount Earl, Bridgend, Glam.

Tynemouth.—Additions, Linskill Secondary School for the E.C.; B. Peel, Ltd., builders, East Mill Works, North Shields.

Wallasey.—Rebuilding Nurses' Home (£29,000) and additional floor, Maternity Hospital (£25,000); borough surveyor.

Wallsend-on-Tyne.—Extensions, Government Training Centre; Ministry of Works, Broadway, Gosforth, Newcastle-on-Tyne.

West Hartlepool.—New junior and infant schools, Seaton Lane (£90,000); W. S. Tatham, quantity surveyor, Wansbeck Gardens.



FAMOUS HYDRO-ELECTRIC STATIONS:

Another photograph of the Bartlett Dam, Arizona, U.S.A., taken in 1941, showing the spillway in operation. Statistical data are not at present available.

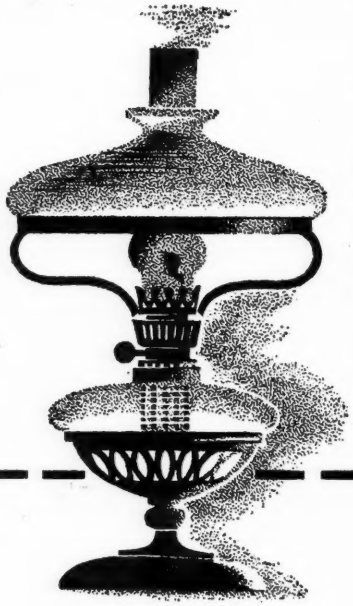
MEASUREMENT LIMITED

Electricity and Water Meters of Quality

TERMINAL HOUSE, GROSVENOR GARDENS, LONDON, S.W.1

CM38

THE MARCH OF LIGHT



Mrs Beeton had to light her kitchen by oil lamps...

today there's

Osram

the wonderful lamp

A G.E.C. PRODUCT

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday,** and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 2/6 per line (approx. 7 words) per insertion; ***ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED:*** — 35/- per inch. Where the advertisement includes a Box Number this counts as six words and there is an additional charge of 6d. for postage of replies.

SITUATIONS WANTED. — Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cheques and Postal Orders should be made payable to ELECTRICAL REVIEW LTD. and crossed.

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF HORNSEY

Housing Scheme No. 16: 116 Flats, "Hillcrest," North Hill, Highgate—Electrical Installation

THE Council invite tenders for the provision of all labour and materials for the whole of the electrical installation in the above scheme. Specifications may be obtained from Mr. J. H. Melville Richards, Hornsey Town Hall, Crouch End, N.8.

Drawings may be examined and other information obtained at the offices of Mr. F. C. Orchard, Chief Electrical Engineer and Manager, Electricity Showrooms, Crouch End, N.8, or at the offices of the Architects, Messrs. T. P. Bennett & Son, 43, Bloomsbury Sq., W.C.1.

Tenders must be received by the undersigned not later than 12 noon on Monday, 28th July, 1947. The Council reserve the right to decline all or any of the tenders received.

H. BEDALE,
Town Clerk.

Town Hall, The Broadway,
Crouch End, N.8. 2466

CUMBERLAND COUNTY COUNCIL

ELECTRICAL contractors desirous of tendering for the proposed Electrical Installation at Aspatria Council School and School House, Aspatria, are invited to submit their names and addresses to the County Architect, 4, Alfred Street North, Carlisle, not later than Monday, 14th July, 1947.

G. N. C. SWIFT, Clerk to the County Council.
2464

THE CORPORATION OF DUNDEE

THE Dundee Corporation invites tenders for Multicore High Voltage and Low Voltage Paper-insulated Cables. Particulars may be obtained on application to P. Philip, M.I.Mech.E., M.I.E.E., City Electrical Engineer.

Tenders to be lodged with the Town Clerk, City Chambers, Dundee, not later than Wednesday, the 13th August, 1947. 2601

SITUATIONS VACANT

COUNTY BOROUGH OF SOUTH SHIELDS ELECTRICITY DEPARTMENT

Appointment of Mains Assistant

APPLICATIONS are invited for the above position. Candidates must have had a sound experience in the construction, operation and maintenance of 11,000-volts and L.T. 3-phase distribution systems, and in the keeping of mains records and plans.

The salary and conditions of employment are in accordance with the N.J.B. Schedule, Class F, Grade 8, at present £442 per annum.

The appointment is subject to the provisions of the Local Government Superannuation Acts, and the selected candidate will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with copies of not more than three recent testimonials, and endorsed "Mains Assistant," should be delivered to the undersigned not later than Monday, 21st July, 1947. Canvassing will be a disqualification, and relationship to any member or senior officer of the Council must be disclosed.

H. AYREY, Town Clerk.

7th July, 1947. 2599

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY

APPLICATIONS are invited for the appointment of Assistant Consumers' Engineer. The person appointed will operate from the Authority's Burford premises, near Dorking, Surrey. He will be required to assist generally with the work of the consumers' department, and particularly with regard to showrooms and showroom sales throughout the distribution area of the Authority.

Conditions of service and salary in accordance with N.J.B. Schedule, Grade 7, first year, Class J, at present £563, rising to £589 per annum.

The person appointed will be required to pass a medical examination by the Authority's medical adviser, and to become subject to the Authority's Superannuation Scheme, which applies generally the provisions of the Local Government Superannuation Act, 1937, including the provisions of that statute relating to transfer values.

Applications, stating age, qualifications and experience, and endorsed "Consumers' Assistant," accompanied by copies of not more than three recent testimonials, must be sent to the Assistant Chief Engineer of the Authority at the under-mentioned address, so as to reach him by not later than the 28th July, 1947. Canvassing, directly or indirectly, will be a disqualification.

A. L. BURNELL,
Clerk to the Authority.

5-6, Lancaster Place,
Strand, W.C.2. 2561

BOROUGH OF SWINDON ELECTRICITY DEPT.

Appointment of Cost Clerk

APPLICATIONS are invited for the appointment of Cost Clerk in the above Department, at a salary in accordance with the General Division of the National Scales of Salaries (commencing at the appropriate salary according to age), plus such cost-of-living bonus as may from time to time be paid by the Corporation (at present £59 16s. per annum). Preference will be given to applicants who have had experience in the costing department of an electricity supply undertaking.

The appointment, terminable by one month's notice on either side, is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination.

Applications, stating age, qualifications and experience, with particulars of past and present employment, and accompanied by copies of three recent testimonials, must be delivered to me not later than the 12th August, 1947, in envelopes endorsed "Cost Clerk, Electricity Department." Canvassing in any form will be deemed a disqualification, and applicants must state whether to their knowledge they are related to any member of the Council, or to any senior officer of the Corporation.

D. MURRAY JOHN,
Town Clerk.

Civic Offices, Swindon.
4th July, 1947. 2606

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR

ASSISTANT Lecturer in Electrical Engineering, with qualifications to teach Mechanical Engineering subjects, required as from 1st October, 1947. Appointment for three years in first instance. Salary £450 p.a. plus superannuation and family allowance if applicable.

Applications should reach the undersigned, from whom further particulars may be obtained, not later than 1st August, 1947.

GLYN ROBERTS, Secretary and Registrar.

1st July, 1947. 2563

COUNTY BOROUGH OF BIRKENHEAD ELECTRICITY DEPARTMENT

Mains Assistant

APPLICATIONS are invited for the position of Mains Assistant in the Mains and Distribution Department, at a salary in accordance with Class H, Grade 8a, of the National Joint Board Schedule of Salaries, commencing at £455 per annum, and subject to a deduction in respect of the Local Government Superannuation Act, 1937.

Applicants, who should preferably be Corporate Members of the Institution of Electrical Engineers, must have had a sound technical and practical experience in the construction, operation and maintenance of 3-phase E.H.T. and L.T., A.C. and D.C. distribution systems, including fault location, transformers, mercury-arc glass bulb and steel tank rectifiers, rotary and motor converters, switchgear, substations, E.H.T. and L.T. overhead lines in rural areas, with all types of protection.

The selected candidate will be responsible to the Mains and Distribution Engineer for assisting in the preparation of detailed layouts, estimates and programmes of schemes involving underground cables, overhead networks and substations, also change-over from D.C. to A.C., and will be required to undertake standby duties.

Members of H.M. Forces are eligible to apply for the position. The successful applicant will be required to pass a medical examination and reside within the area of supply.

Applications, stating age, whether married or single, present appointment and salary, experience and qualifications, accompanied by copies of not more than three recent testimonials, are to be delivered to the Borough Electrical Engineer, Craven Street, Birkenhead, not later than 12 noon on Saturday, the 26th July, 1947. Canvassing, directly or indirectly, will disqualify.

E. W. TAME,
Town Hall, Birkenhead. Town Clerk.
26th June, 1947. 2554

SHEFFIELD CORPORATION ELECTRICITY DEPT.

District Mains Engineer

APPLICATIONS are invited for the above position. Applicants must possess an engineering degree or equivalent technical qualifications admitting to corporate membership of the Institution of Electrical Engineers, and must have had a thorough engineering training including experience in the mains department of a large supply undertaking. The person appointed will be required to take charge of all mains and service work in a district containing heavy industrial and densely developed residential areas, distribution being mainly by underground cables of all voltages up to 33 kV.

The salary will be in accordance with Class M, Grade 8, of the National Joint Board Schedule, commencing at £635 per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937. Applicants must preferably be not more than 40 years of age, or have had previous Local Authority service, carrying transfer value within the meaning of the Act. The selected applicant will be required to pass a medical examination.

Applications are to be returned to me not later than Thursday, 24th July, 1947, accompanied by copies of not more than three recent testimonials. Canvassing or any communication to a member of the Council, either directly or indirectly, is prohibited, and is a disqualification.

JOHN R. STRUTHERS, M.I.E.E.,
Commercial Street, General Manager and Engineer.
Sheffield, 1. 2469

UNIVERSITY OF CAPE TOWN

Lecturer in Electrical Engineering

THERE is a vacancy in the Department of Electrical Engineering for a Temporary Lecturer. The appointment will be for a period of two years certain at a salary of £550 per annum, plus cost-of-living allowances (at present £119 per annum for a married man and £34 per annum for a single man). Experience in the high frequency field is essential.

Applications must be submitted in triplicate and must give age, qualifications and experience and the names of two or three referees to whom the University may refer. Two copies of the application must reach the Secretary of the Universities Bureau of the British Empire, 8, Park Street, London, W.1, by 21st August, 1947, and a third copy should be sent direct (preferably by air mail) to the Registrar, University of Cape Town, Private Bag, Rondebosch, South Africa. 2481

COUNTY BOROUGH OF WEST HAM ELECTRICITY DEPARTMENT

Senior Technical Assistant, Consumers' Department

APPLICATIONS are invited for the permanent appointment of a Senior Technical Assistant (Consumers' Department). Salary and conditions in accordance with the National Joint Board Schedule, Class J, Grade 7, at present £591 3s. to £618 9s. per annum.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess technical qualifications admitting to such membership, and must have had a sound technical training and practical experience in connection with the preparation of schemes and specifications for electrical installations for hospitals, institutions, industrial and large commercial premises. Applicants should be experienced in the utilisation of electricity for industrial power and heating processes, and should be fully conversant with the Wiring Regulations of the Institution of Electrical Engineers, Factory Acts and Electricity Supply Regulations, also the published Codes of Practice.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to the successful applicant passing a medical examination. Canvassing, either directly or indirectly, will be a disqualification.

Further particulars of the duties and terms of appointment may be obtained from Mr. Jas. W. J. Townley, C.B.E., M.I.E.E., Engineer and Manager, County Borough of West Ham Electricity Department, 84/86, Romford Road, Stratford, E.15. Applications should be received not later than Monday, 21st July, 1947.

E. E. KING,
Town Hall, Town Clerk.
West Ham, E.15. 2438

BOROUGH OF WATFORD

Chief Engineer and General Manager

APPLICATIONS are invited from Chartered Electrical Engineers experienced in the operation, management and administration of an electricity supply undertaking owning a selected generating station.

The salary, which will be in accordance with the scale in the agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers, dated 9th July, 1941, approximates at present £2,000 per annum, and under Clause 10 of the agreement the salary for the first year will be 85% of the scheduled amount, 92½% for the second year, and full salary thereafter. In addition to salary a car allowance will be payable according to the Council's scale.

The appointment will be subject to the selected candidate passing a medical examination, and determinable by three months' notice on either side. Preference will be given to candidates of 50 years of age or under.

Applications, stating age, qualifications and experience, should be accompanied by copies of three testimonials, and forwarded in envelopes endorsed "Chief Engineer and General Manager," so as to reach the undersigned not later than August 15th, 1947. Canvassing, directly or indirectly, will result in disqualification.

A. N. SCHOFIELD,
Town Hall, Watford. Town Clerk.
AWB/EJT.
27th June, 1947. 2471

HIS MAJESTY'S COLONIAL SERVICE

APPLICATIONS are invited for the appointment of Assistant Electrical Engineer, Labour Department, Tanganyika Territory. Candidates must be British subjects and should not be more than 35 years of age. The minimum qualification entitling candidates to consideration is Graduate Membership of the Institution of Electrical Engineers, or degrees or diplomas giving exemption from Parts A and B of the examination of that body.

The selected officer will be required to assist the Electrical Engineer in the inspection of public supply systems and electrical installations in general throughout the Territory. He will also be responsible for the installation and maintenance of X-ray and electro-therapeutic equipment in Government hospitals. The appointment will be on agreement for a period of two years in the first instance at a salary of £720 per annum. A cost-of-living allowance is payable and free furnished quarters or an allowance in lieu are provided, together with free passages for the selected officer and, if married, for his wife. Free medical attention is also provided.

Applications, stating age, qualifications and experience, should be addressed at once to the Director of Recruitment (Colonial Service), Colonial Office, 15, Victoria St., London, S.W.1. 2583

COUNTY BOROUGH OF SWANSEA ELECTRICITY DEPARTMENT

Appointment of Chief Chemist

APPLICATIONS are invited from men not over the age of 45 years, unless at present in the employ of a Local Authority, for the position of Chief Chemist at Tir John Power Station, Swansea. The person appointed will be required to take charge of the Laboratory at the Power Station.

Salary and conditions of employment in accordance with Class J, Grade 7, of the N.J.B. Schedule, at present £563-£589 per annum.

Candidates should preferably have a university degree, but applications will be considered from persons with recognised technical qualifications. All candidates must have had a general chemical training and previous practical experience in power station routine, including the softening and treating of boiler water, boiler testing, chlorination of condenser circulating water and coal analysis. Previous experience of anthracite coal will be an advantage.

The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, and to the passing of a medical examination

Applications, stating age, qualifications, training and experience, together with copies of not more than two recent testimonials, must reach the undersigned not later than Friday, 18th July, 1947, endorsed "Power Station Chemist." Canvassing, either directly or indirectly, will be a disqualification.

T. B. BOWEN,
Town Clerk.

Swansea Corporation,
The Guildhall, Swansea. 2470

THE NORTHAMPTON ELECTRIC LIGHT & POWER CO. LTD.

APPLICATIONS are invited for the following positions: SALES ENGINEER. Applicants must be capable of planning and estimating for domestic and commercial installations and conversant with the sales organisation of an electricity supply undertaking. Salary from £500 to £600 per annum in accordance with experience and ability.

TESTING ASSISTANT. Applicants must have had a sound technical training and experience in H.V. pressure testing of cables, overhead lines, switchgear and transformers, and also of modern methods of fault location. Testing of protective systems and knowledge of automatic control equipment would be an advantage. Salary about £450 per annum according to experience.

MAINS ASSISTANT ENGINEERS. Applicants must be technically qualified and have had experience in overhead and underground construction and maintenance and operation of static substations. Salary about £450 per annum according to experience.

JUNIOR MAINS ASSISTANTS. Applicants must have had a good technical education, with some experience in the construction and maintenance of E.H.T. and L.T. overhead and underground distribution systems, services and mains records. Commencing salary according to experience.

E. G. H. JACKSON,
General Manager.

25, Bridge Street,
Northampton. 2598

BRIERFIELD URBAN DISTRICT COUNCIL

Appointment of Electrical Engineer

APPLICATIONS are invited for the above position at an inclusive salary in accordance with Clause 10 of the Agreement dated the 9th of July, 1941, made between the National Joint Committee of Local Authorities and Chief Electrical Engineers, and will commence at £523 12s. per annum, rising at the beginning of the third year of service to the full scale.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the person appointed will be required to pass a medical examination, and subject to three months' notice on either side.

Candidates must be Corporate Members of the Institution of Electrical Engineers, and have had experience in a responsible position in the administration, management and development of an electricity undertaking. Applications, stating age, experience and qualifications, and accompanied by not more than three recent testimonials, must be delivered to the undersigned not later than the 21st July, 1947. Canvassing, directly or indirectly, will be a disqualification.

H. L. SMITH,
Clerk to the Council.

Town Hall,
Brierfield, Lancs.
18th June, 1947. 2378

COUNTY COUNCIL OF DURHAM EDUCATION DEPARTMENT

Stockton-on-Tees Technical School and Evening Institute

REQUIRED as soon as possible, two full-time Assistants to teach Engineering subjects.

The candidates appointed may be expected to divide their duties between Preparatory Day Engineering Course and Senior Engineering Courses (part-time day and evening) up to National Certificate standard. Candidates must have Graduate or equivalent qualifications in Mechanical Engineering and have had good practical engineering experience.

Salary will be paid in accordance with the Burnham Scale for teachers in Technical Schools.

For forms of application (which must be returned, duly completed, as soon as possible) apply, enclosing stamped addressed foolscap envelope, to the Director of Education, Shire Hall, Durham.

A. A. DENHOLM,
Director of Education.

Shire Hall, Durham.
28th June, 1947. 2468

COUNTY BOROUGH OF CROYDON ELECTRICITY DEPARTMENT

Control Engineer

APPLICATIONS for this appointment at the Corporation's Generating Station—a "Selected" station of 88-M.W. capacity—must have had a sound technical training and experience in operating E.H.T. switchgear, preferably connected to the "Grid" System, and of an equivalent capacity. Salary, Class H, Grade 9a (3), £400 1s. per annum.

The appointment will be subject to the Local Government Superannuation Act, 1937, and to a medical examination; it will be terminable by one month's notice on either side.

Applications (with copies of three recent testimonials), endorsed "Control Engineer," to be delivered not later than 21st July, 1947, to the General Manager, Electric House, Wellesley Road, Croydon, stating age, training, qualifications and experience. Canvassing will disqualify.

E. TABERNER,
Town Clerk.

Town Hall, Croydon.
July, 1947. 2589

BOROUGH OF BRIGHOUSE ELECTRICITY DEPT.

APPLICATIONS are invited for the position of Meter Tester and Repairer of A.C. single-phase quarterly and prepayment meters.

Conditions of service and rates of pay will be in accordance with J.I.C. Schedule (No. 2 District). Present rate 29.25d. per hour. The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and to the passing of a medical examination.

Applications, from men between 25 and 40 years of age, accompanied by copies of two recent testimonials, should be received by the Electrical Engineer, Huddersfield Road, Brighouse, Yorks, not later than Thursday, the 31st July, 1947. Canvassing, directly or indirectly, is prohibited, and candidates should state in their application whether to their knowledge they are related to any member of, or the holder of any senior office under, the Council.

ERNEST H. CLEGG,
Town Clerk.

Town Hall,
Brighouse. 2600

EAST GRINSTEAD U.D.C. ELECTRICITY DEPT.

Appointment of Shift Charge Engineer

APPLICATIONS are invited for the above from qualified Shift Charge Engineers with experience of glass bulb rectifiers, running of rotary convertor, semi-Diesel engines, etc. Wages and conditions will be in accordance with the National Joint Board Schedule, Class A, Grade 8, at present £337 per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, whether married or single, qualifications and experience, together with copies of two recent testimonials, should be delivered to the undersigned not later than noon on Thursday, the 17th July, 1947, in an envelope endorsed "Shift Charge Engineer."

L. R. BENNETT,
Clerk to the Council.

Council Offices,
East Court, East Grinstead.
3rd July, 1947. 2553

NORTH-WEST MIDLANDS JOINT ELECTRICITY AUTHORITY

Meaford Generating Station

APPLICATIONS are invited from men who are not more than 45 years of age for the following posts:—CHIEF CLERK. N.C.S. Scale, £380-£425 per annum plus bonus. Candidates must have had experience in power station office organisation, and be competent to control the general office staff.

INSTRUMENT ENGINEER. J.10, £355-£371 p.a. Candidates should have had experience in the manufacture and installation of power station metering and control equipments, or have had power station experience on the maintenance of these.

Application forms may be obtained from the undersigned, and should be returned not later than 21st July, 1947, to F. Favell, M.I.E.E., M.I.Mech.E., Chief Engineer and Manager, North-West Midlands Joint Electricity Authority, York Chambers, Kingsway, Stoke-on-Trent. 2590

MERSEY POWER COMPANY LIMITED

Works Chemist

APPLICATIONS are invited for the position of Works Chemist at a modern power station. Applicants should be qualified and have had experience in the analysis of water, oil and fuels, and the treatment of boiler feed water.

Salary and conditions of appointment in accordance with N.J.B. Agreement, Class J, Grade 8, at present £521 to £544 per annum.

Applications, stating present position, age, details of training and experience, together with copies of testimonials, to be addressed as below and received not later than 16th July, 1947. Envelopes should be endorsed "Works Chemist."—General Manager and Engineer, Mersey Power Company Limited, Percival Lane Power Station, Runcorn, Cheshire. 2452

BATTERSEA BOROUGH COUNCIL ELECTRICITY DEPARTMENT

Meter Tester

APPLICATIONS are invited for the position of Meter Tester. Wages and conditions in accordance with the agreement of the District Joint Industrial Council, at present £6 11s. 3d. gross per week of 47 hours.

Applicants must be capable of testing all types of both A.C. and D.C. meters, and experience in the testing of indicating and recording instruments would be an advantage.

Applications, with copies of recent testimonials, to reach the General Manager and Engineer, Electric House, 204, Lavender Hill, S.W.11, not later than 25th July, 1947.

R. G. BERRY,
Town Clerk.

Town Hall,
Battersea, S.W.11. 2496

WIGAN CORPORATION ELECTRICITY DEPT.

Meter Repairers and Testers

APPLICATIONS are invited for the appointment of Meter Repairers and Testers in the Wigan Corporation's Electricity Dept. Applicants must be capable of repairing and testing single-phase and polyphase meters.

The wages and conditions will be in accordance with the agreement of the National Joint Industrial Council for the Electricity Supply Industry; wages at present £5 17s. 6d. gross per week of 47 hours.

Applications, in writing, giving details of training and experience, should be addressed to the Electrical Engineer, Bradford Place, Wigan, not later than Monday, the 21st July, 1947.

ALLAN ROYLE, Town Clerk. 2575

A leading London cinema group requires a resourceful man with Electrical Engineering or Science Degree. Experience should embrace the types of electrical and mechanical equipment employed in cinemas. Knowledge of operational research useful. Candidates should preferably be under 40 years of age. Write, giving full particulars, to Managing Director.—Box 2518, c/o The Electrical Review.

AN electrical engineering firm in the Midlands require Senior Draughtsman experienced in the mechanical design and construction of turbo and engine-driven alternators. Good salary and prospects to suitable men. Please give full particulars of training and experience. Housing accommodation provided. Write—Box No. 354, 8, Serle Street, London, W.C.2. 137

AISH & Co. Ltd., Bournemouth, require an experienced young Lady Assistant for their electrical showrooms. Apply by letter, stating age, previous experience and salary required. 2547

AN Electrical Distribution Engineer for a system with an annual output of about 500,000,000 kWh. Candidates should have a University Degree and power company experience in operations and measurements. Salary will be according to age and experience.—Box 2620, c/o The Electrical Review.

APPLICATIONS are invited for the position of Lady Technical Laboratory Assistant to assist in general investigation and routine testing of components and materials. Applicants should have at least a basic knowledge of electrical technology and chemistry or physics. Write in the first instance to Personnel Manager, E. K. Cole Ltd., Southend-on-Sea, Essex, stating qualifications, experience and age. 2535

APPLICATIONS are invited from qualified engineers for an Electrical Supply Undertaking in the Middle East. Applicants should be 30-35 years of age and have had sound technical training and experience in the operation and maintenance of an undertaking with medium pressure boiler and turbine plant. Administrative experience in an electricity supply undertaking would be an advantage. The appointment would be for three years in the first instance, subject to renewal for similar periods. Salary £120 per month, plus suitable house allowance, with first-class passage to and from England and three months' leave on full salary in the United Kingdom every three years. Applications to be addressed to—Box 2515, c/o The Electrical Review.

APPOINTMENT of Substation Shift Engineers. Applications are invited from men having good general and technical education and with recent experience in the operation of rotary converting substations, by a large undertaking in the London area. Salary and conditions in accordance with N.J.B. Scale, Class F, Grade 8b. Applications, giving full particulars of training, experience and position now held, together with copies of recent testimonials, should be sent to—Box 2577, c/o The Electrical Review.

ARMATURE Winders and Improvers urgently required. Top rates and good conditions.—Box 113, c/o The Electrical Review.

ARMATURE Winders and Improvers urgently required. Top rates and good conditions.—Collins Electrical Ltd., 22, St. Alban's Place, London, N.1. 85

ARMATURE Winding Chargehand for repair shop, to control female labour on small armature and stator windings. Applicant must have experience of A.C. and D.C. windings.—The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers St., Wolverhampton. 2459

ASSISTANT Chief Draughtsman for large North London engineering company. Must have experience of electrical and mechanical assembly design of radio receivers. Good salary and excellent prospects. Write—"A.C.D." Box 0/5443, A.K. Advg., 212a, Shaftesbury Avenue, W.C.2. 2487

ASSISTANT Electrical Engineer for large gold mine in West Africa, with prospects of ultimate promotion to Electrical Engineer. Must be technically trained and have a good working knowledge of turbo and Diesel electric power station operation, workshop and foundry practice. Electrical experience should extend to modern electrical mining installations, large generating plant and motor-driven machinery. Age not over 40 years. Contract continuous, tours of 15 months with 3 months' leave on full pay, free passage, accommodation and medical attention. Salary £720 per annum, plus £60 per annum cost-of-living allowance. Apply by letter, giving full particulars, to—Box 1384, Walter Skinner Ltd., 20, Copthall Avenue, London, E.C.2. 2576

BRITISH Electric Co. (Beco Ltd.), require Armature Winders, top rates and conditions. Apply—British Electric Co. (Beco Ltd.), 25/29, Lower Road, Rotherhithe, S.E.16. 146

CABLE (V.I.R.) Sales Department of manufacturing electrical engineers (London) requires an Assistant, age 25/40 years, with knowledge of cable business and good experience in dealing with orders and correspondence. Reply, stating age, experience and salary required, to—Box 2421, c/o The Electrical Review.

CHIEF Engineer for iron and steel works in North-West England, comprising coke ovens, blast furnaces, steel plant, rolling mills, etc. Previous experience in similar plants not essential. Applications, giving full particulars of training, experience, appointments held and salary required, to be addressed to—The Secretary, Workington Iron and Steel Company Limited, Moss Bay, Workington. 2623

CHIEF Progress Engineer, by firm of electric motor manufacturers. Must have had executive experience in similar capacity. Please state fully experience and salary required.—Box 2586, c/o The Electrical Review.

CHIEF Designer of electric desk and ceiling fans, also fractional h.p. motors, wanted to take charge of department, Birmingham district. Very good opportunity. Give full particulars of education and experience. State age and salary required.—Box 2492, c/o The Electrical Review.

COST Clerk, by London firm of electrical contractors. Write stating age, full particulars of experience and salary required.—Box 2426, c/o The Electrical Review.

DE Havilland Propellers Ltd. invite applications for the following vacancy: Draughtsman (design), with good working knowledge of electrical mechanism. Successful applicant will be required to work a 39-hour, 5-day week. Application should be made in writing, stating age, experience and salary required, to—The Personnel Manager, De Havilland Propellers Ltd., Hatfield, Herts. 11

DESIGN Draughtsman required immediately for employment in South-East London area, with experience of high-speed mechanisms. Applications are invited from qualified draughtsmen who are desirous of advancement and willing to accept responsibility. Write, giving full particulars of age, experience, qualifications and present salary, to—Box 149, c/o The Electrical Review.

DISTRICT Manager for Manchester branch of large firm of electrical contractors. Sound technical engineer, capable office administrator, and preferably with sales connection. Position offers attractive prospects to energetic man. State full particulars education, training, experience, salary required.—Box 2555, c/o The Electrical Review.

DRAKE & Gorham Ltd. require an Assistant Electrical Engineer in their Reading Branch; must be capable of interviewing, estimating, and the supervision of all classes of installation work, including plant. Write, giving full details of experience, age and salary required, to—The Secretary, Drake & Gorham Ltd., 36, Grosvenor Gardens, London, S.W.1. 2615

DRAUGHTSMAN, Assistant, by well-known firm concerned with sound film reproducing and recording equipment. Progressive opening for young applicant with suitable training in light electro-mechanical apparatus and some electrical knowledge. London. State age, education, experience and salary required.—Box 2578, c/o The Electrical Review.

DRAUGHTSMAN, Leading Electrical. Must have experience of design, layout and diagrams for remote control panels.—Box 2490, c/o The Electrical Review.

DRAUGHTSMAN required, Enfield district, age between 25/35, with design experience of fractional h.p. electric motors. Applicants with workshop experience plus sound academic background (B.Sc.Eng. or A.M.I.Mech.E.) would be preferred. Reply, age, experience, qualifications and salary required—Box 2311, c/o The Electrical Review.

DRAUGHTSMAN required (Walthamstow district) with good general experience in machine and plant design. Good working conditions. Pension Scheme. Reply, stating age, experience and salary required, to—Box 2618, c/o The Electrical Review.

DRAUGHTSMAN, senior H.N.C. or equivalent, for on-load tap change gear, control gear, etc. Five-day week, pension fund; reply, stating experience and salary required, to—Hackbridge & Hewittic Electric Co. Ltd., Hersham, Walton-on-Thames, Surrey. 2617

DRAUGHTSMAN with experience in design of centrifugal pumps, National Certificate standard. A.E.S.D. rate, excellent prospects.—Chance Bros., Smethwick. 2537

DEVELOPMENT Engineers. Several vacancies occur in the laboratories of a well-known electrical engineering company in the North for Assistants who should be Engineers or Physicists, preferably graduate apprentices with practical experience in high vacuum technique, electronic or discharge devices or testing same.—Box 2461, c/o The Electrical Review.

ELECTRIC Lamps. Applications are invited from experienced men to take charge of the Filament Dept. of Ekco-Ensign Electric Ltd. Wide practical experience of filament preparation essential, together with ability to control associated photometry and statistical records. Apply to—Personnel Manager, E. K. Cole Ltd., Southend-on-Sea, Essex. 2534

ELECTRIC Lamps. Foremen wanted, experienced in high-speed mass production, by large manufacturers in London area. Good salary and prospects carrying pension. Send full particulars to—Box 2568, c/o The Electrical Review.

ELECTRICAL Draughtsman with experience of electrical installations on motor vehicles. Write, stating age, experience, salary required, to—Personnel Dept., Austin Motor Co. Ltd., Longbridge Works, Birmingham. 2533

ELECTRICAL (Senior) Draughtsman for post in London office on central station layout, substations, outdoor switching and transformers. Sound basic training essential, with initiative. Salary up to £11 10s. according to experience. Pension fund. State age, full details training, salary requirements.—Box 917, Judds, 47 Gresham St. E.C.2. 2581

ELECTRICAL Engineers, Birmingham centre, require qualified Engineer for lighting and power installation, street lighting, power factor correction, etc. State age, experience, and salary required.—Box 2621, c/o The Electrical Review.

ELECTRICAL Engineers, by London engineering firm: should have had practical or test bed experience in handling electrical machinery. Engineering degree or equivalent essential, mechanical workshop experience an advantage. Age about 30. Apply, giving details of age, qualifications, experience and salary required, to—Box 444, c/o J. G. King & Son, 150, Fleet St., London, E.C.4. 2532

ELECTRICAL Equipment Draughtsmen with maintenance experience. Payment according to A.S.D. scale. Applications in writing to—The Personnel Manager, British Enka Ltd., Aintree, Liverpool, 9. 2530

ELECTRICAL Surveyor by Insurance Co., Glasgow district. Higher National Cert., manufacture and repair experience medium power motors. £400 rising to £600, non-contributory pension.—Box 6195, c/o The Electrical Review.

ELECTRICAL Wholesalers require Storeman for purpose of checking and packing for despatch. Knowledge of electrical material essential.—London Electrical Company Ltd., 92, Blackfriars Road, S.E.1. 41

ELECTRICIAN Fitter for maintenance of electric goods and passenger lifts in London area.—Box 2585, c/o The Electrical Review.

ELECTRICIAN for London contractor, must have served apprenticeship. Permanent job for live man with thorough knowledge of trade. Telephone CUN. 2401. 2392

EXCEPTIONAL opportunities for Draughtsmen are afforded by an expansion of the Marconi drawing offices, Chelmsford, for the design of radio equipment. Radio experience desirable but not essential, although drawing office experience of electrical and/or mechanical apparatus definitely required. Much of the work is in close collaboration with the research and development engineers. Apply—The English Electric Co. Ltd., Queens House, Kingsway, W.C.2. 2595

EXPERIENCED Engineer, about 30/35 years of age, for training as Assistant to Chief Engineer to large manufacturing company. B.Sc.Eng. or other first-class qualification essential. Good practical experience in general mechanical engineering and drawing office required. A knowledge of chemistry, also some experience in handling male and female labour, would be an advantage, though not essential. Applicant should be prepared to live in London and to travel abroad when required. Reply giving age, full details of experience and references, also salary required.—Box No. 310, John Hart & Co., 22, Northumberland Avenue, W.C.2. 2498

EXPERIENCED Industrial Lighting Engineer required for London area. Excellent prospects for the right type of man. Apply, giving full particulars, to—Veritys Ltd., 66, Quay Street, Manchester, 3. 2567

FEMALE Invoice Typist, experienced preferred, for electrical wholesale distributors. State wages, etc.—L.M., Sloan Electrical Co. Ltd., 41 Kingsway, W.C.2. 2260

FIRM of manufacturing electrical engineers require person with experience in compiling catalogues and leaflets, capable of taking charge of advertising department. Only persons with experience need apply.—Box 2393, c/o The Electrical Review.

FIRST-class Assistant required by manager of an electrical firm, with sound knowledge of the electrical manufacturing trade, particularly motor starters and switchgear. The appointment calls for an experienced engineer with an up-to-date knowledge of factory production and affords excellent opportunities of advancement. Apply, with full details of education, qualifications, experience, age and salary required, to—Box 2338, c/o The Electrical Review.

FOREMAN for Electric Motor Assembly. Experience and skill in handling labour, and in first-class production methods. Young man with drawing office and toolroom experience preferable. Apply in writing, giving full details and references to—Manager, Electrical Dept., H. Frost & Co. Ltd., Fieldgate, Walsall. 2424

JUNIOR Assistant for Electrical Stores. Knowledge of all electric accessories, cables, etc., essential. Good wages and prospects. Apply, giving full details of experience, wages, etc., to—Staff Manager, W. N. Froy & Son Ltd., Brunswick Works, Hammersmith, W.6. 140

JUNIOR Assistant Engineer with experience of steel tower transmission line construction and survey, wood pole lines and substation construction. Midlands area. Write, stating age, experience and salary.—Box 2442, c/o The Electrical Review.

LADY or gentleman as assistant to Export Manager by City firm. Must be good at figures, knowledge of Portuguese or Spanish an advantage. No Saturdays. Write—Box "F.H.Q.", c/o 95, Bishopsgate, E.C.2. 2479

JUNIOR Draughtsman (Detail) required West London area, preferably with some experience of telecommunications equipment, or instruments. Good prospects in small drawing office dealing with high-class equipment. State age, experience, salary.—Box 2579, c/o The Electrical Review.

LEADING electrical manufacturers require special Sales Representatives to cover following divisions of the National Coal Board: Scotland, North-Eastern, North-Western, East Midlands, West Midlands, South-East. Gentlemen well connected with collieries apply in strict confidence to—Box No. A.B.545, c/o Central News, 17, Moorgate, E.C.2. 2531

LEADING firm of mechanical engineers in Birmingham area require an Electrical Engineer to assist in the application and standardisation of electric drives and control to their products. Age 22/30. Grad. I.E.E. minimum. Sound electrical apprenticeship with test and D.O. experience, including preparation of control schemes. Some experience of electronics desirable. Applications, which will be treated in confidence, should give full details and be addressed to—Box 2499, c/o The Electrical Review.

LONDON Hospital Medical College and Queen Mary College (University of London) invite applications for post of Lecturer in Engineering Physics, to work in the Electrical Engineering Department of Queen Mary College and the Electro-Therapeutic Department of the London Hospital Medical College. The Lecturer will teach and research in the physics of high voltage engineering and will also be concerned in the development of extra high voltage X-ray tubes. Commencing salary £550 per annum, with a family allowance of £50 per annum per child. Applications (six copies with names of two referees) to reach the Registrar, Queen Mary College, Mile End Road, E.1, by 26th July, 1947. 2562

MANAGER for small progressive firm electrical engineers in Central London. Full details to—Box 6179, c/o The Electrical Review.

MECHANIC for experimental work in light engineering factory, Epsom. Able to work on own initiative in developing mechanisms for improving production methods. Write, stating age, experience and wages required, to—Box 2354, c/o The Electrical Review.

MECHANICAL Draughtsman with experience of small mechanisms and special purpose machines required by old-established firm of electrical component manufacturers. Write, giving full particulars, to—Box 2559, c/o The Electrical Review.

NEWCASTLE electrical contractor requires Electrical Engineer, estimating and drawing experience of all classes electrical installation work essential. Good prospects for right man. Applicants replying are requested to state age, salary required, copies of references, and details of past experience.—Box 2574, c/o The Electrical Review.

OLD established electrical wholesalers have vacancy for a youth on trade counter. Excellent opportunities for advancement.—Box 2395, c/o The Electrical Review.

PRODUCTION Development. Senior Production Engineer with specialised knowledge of production methods, by large light engineering company in London area. Suitable applicant should have experience of the design of tools and fixtures, and knowledge of estimating. Write, stating age, experience and salary required, to—Box 2528, c/o The Electrical Review.

PROGRESSIVE soft drink company has vacancies for Young Men with general engineering experience covering boilers, electrical equipment, conveyors, etc., or with laboratory experience (Inter. B.Sc.) of production and quality control. All applicants must have reached matriculation standard and be between the ages 25-30. They must be prepared for a working training of several years at a reasonable salary to fit themselves for responsible factory positions. Apply in writing, giving full particulars, to—Box 2564, c/o The Electrical Review.

RADIO Cabinet Designer for large North London company. Previous experience essential. Write full details to—"R.C.D.", Box 0/5440, A. K. Advg., 212a, Shaftesbury Avenue, W.C.2. 2488

REDIFFUSION Ltd. have a vacancy in their development laboratory for a Senior Radio Engineer capable of taking full responsibility development and design of transmitters, varying powers and frequencies. Only live men with practical experience need apply to Manager, Rediffusion Ltd., Broomhill Road, Wandsworth, S.W.18, giving details of technical qualifications, salary expected and when available. 2616

REPRESENTATIVE, elec., radio, garage lines, London and suburbs. Applicants must apply in writing only, stating age, experience, etc. Car owner an advantage.—Universal Dis. Co., 68, Gt. Eastern St., E.C.2. 2527

REPRESENTATIVE required for Scotland for well-known manufacturer. State previous experience with wholesale trade and supply companies, and remuneration required.—Box 138, c/o The Electrical Review

REPRESENTATIVE required for South-West Coast, West Coast and South-West Wales area for well-known manufacturer. State experience with wholesale trade and supply companies, and remuneration required.—Box 139, c/o The Electrical Review.

REPRESENTATIVES required by well-known manufacturers of water heaters and other electrical appliances for London, Bristol and South Coast. Applicants should have first-class connections with supply authorities, wholesalers and contractors. Prospects of branch managership. Only representatives of approved ability need apply.—Box 2625, c/o The Electrical Review.

REPRESENTATIVES required for Temco Clocks for Scotland, Northern England and Midlands. Replies, stating age, previous experience, whether car owner and remuneration required, in strictest confidence, to—Sales Director, T.M.C.-Harwell (Sales) Ltd., 37, Upper Berkeley Street, London, W.1. 2325

REQUIRED for the Manchester district, Electrical Estimating Engineer, experienced in preparing quotations for A.C. and D.C. motors, generators and appropriate control gear, etc. Knowledge of current B.S. Specifications necessary. State experience, age and salary expected.—Box 2519, c/o The Electrical Review.

REQUIRED by revolving electrical machine manufacturers, an Engineer who is capable of examining drawings and apparatus going through the works, with a view to modifying and altering where necessary to cheapen or to reduce costs of manufacture. Range ¼ to 100 h.p. State experience and salary required.—Box 2549, c/o The Electrical Review.

SENIOR Jig and Tool Draughtsmen, by progressive concern engaged in telecommunications industry, situated in South-East London area. Preference will be given to applicants who have served an apprenticeship and received a thorough practical training. Applications in writing, stating age, qualifications, experience and salary required, to—Box 150, c/o The Electrical Review.

SKILLED and semi-skilled men and women for test room work. Knowledge of electrical precision instruments is necessary. Apply Cambridge Instrument Co. Ltd., Sydney Rd., Muswell Hill, N.10. 2391

STRUCTURAL Designer and Structural Draughtsman in London area for work in connection with overhead lines, radio towers, etc.; 5-day week, superannuation fund, good prospects. Apply in writing to—Staff Officer, British Insulated Callender's Cables Ltd., Norfolk House, Norfolk Street, W.C.2. 75

SUPERTENSION Electric Cable Plumber-Jointers, for contracts department of large cable making company. Work mainly in London area. Write, stating age and experience, to—Box 2619, c/o The Electrical Review.

SUPERVISOR wanted for electrical contractor, London. Must have thorough knowledge of trade, able to control labour and estimate. Own car an advantage. Excellent prospects for live man. Write, stating age, qualifications, salary required, to—Box 2359, c/o The Electrical Review.

TELECOMMUNICATION Engineers required with some technical training, good knowledge of auto. telephone exchange practice, and experience with circuits or apparatus or equipment. Also men with some technical training and practical knowledge of exchange wiring for preparing wiring drawings. Applicants should give full details of age, training, experience, and state salary required.—Ref. 424, Siemens Brothers & Co. Ltd., Woolwich, S.E.18. 2308

TEST Bed Assistant, with experience in testing all types A.C. and D.C. motors.—British Electric Co. (Beco Ltd.), 25/29, Lower Road, Rotherhithe, S.E.16. 147

THE National Boiler & General Insurance Company Limited, St. Mary's Parsonage, Manchester, 3, have vacancies for Lift and Crane Inspecting Engineers. The position is a permanent one with progressive salary, starting at £400 and rising to £600 per annum with non-contributory pension. Candidates should be between 26 and 33 years of age, having served an apprenticeship and having sound practical and theoretical knowledge in mechanical and electrical engineering, with some drawing office experience. Technical qualifications should be at least equivalent to Higher National Certificate standard. Applicants with 1st Class B.O.T. certificate would be considered. Apply in own handwriting marked "Lift and Crane Inspecting Engineer," giving age, training and experience, also copies of testimonials.—Box 2622, c/o The Electrical Review.

TRENT Valley & High Peak Electricity Company Limited (Trent Valley Area). Applications are invited for the position of Linesman (overhead power) in the Trent Valley area of supply. Conditions of service and rate of pay in accordance with N.J.I.C. Zone A, at present 29d. per hour. Applicants eligible to join the Company's Staff Pension Scheme on completion of required service. Applications, stating age, experience, together with testimonials, should be sent to—E. J. Cook, Engineer & Manager, 21, Upper Brook Street, Rugeley. 2602

THE Mid-Southern Utility Company. Plumber-Jointers and Overhead Linesmen: Applications are invited from Plumber-Jointers and Overhead Linesmen (H.T. and L.T.). Wages and working conditions in accordance with N.J.I.C. Schedule. Replies, stating experience, age, whether married or single, should be addressed to the company at Victoria Road, Aldershot. 2580

TIME and Motion Study Engineer, by rayon yarn producers. Must have first-class experience and be competent to initiate dept. dealing with incentive schemes and studies for training dept. Applications, stating qualifications, experience, age and salary, to—Box D.555, Lee & Nightingale, Liverpool. 2491

TRENT Valley & High Peak Electricity Company Limited (Trent Valley Area). Applications are invited for the position of Electrician Wireman in the Trent Valley area of supply. Conditions of service and rate of pay in accordance with N.J.I.C. Zone A, at present 30d. per hour. Applicants eligible to join the Company's Staff Pension Scheme on completion of required service. Applications, stating age, experience, together with testimonials, should be sent to—E. J. Cook, Engineer & Manager, 21, Upper Brook Street, Rugeley, Staffs. 2603

WELL-known non-ring manufacturer requires a Representative for the North-East territory. One resident on the ground preferred. Applicants must be really "live" and have a good knowledge of electric cables, preferably with a connection. Good salary and expenses. Splendid opportunity for the right man.—Box 2390, c/o The Electrical Review.

WEST Africa. Practical Electrician, with radio knowledge and experience in wiring, general maintenance work and a fair knowledge of estimating. Age under 32. Commencing salary according to age and experience, but not less than £500 per annum. Tour of 21 months with leave on full pay. Free passages, furnished quarters, medical attention in Africa. Separation and children's allowances at present allowed and membership of pension fund. Write, giving particulars, to—Box 1787, c/o Charles Barker & Sons Ltd., 31, Budge Row, E.C.4. 2566

WIRING Diagram Draughtsmen. A large electrical manufacturing company located in Central Ontario, Canada, require the services of two Wiring Diagram Draughtsmen who are capable of drawing schematic diagrams, protective systems and 3-phase central generating station diagrams. Preference will be given to men with 6 to 8 years of similar experience. Give full particulars regarding age, married or single, education, training and experience, and state if willing to accept air passage to Canada.—Box 2552, c/o The Electrical Review.

WORKS Manager required for light engineering factory in South London. Candidates should be good engineers, capable organisers and strong disciplinarians. The position is permanent and progressive. Reply giving full details of education and experience, age and salary required.—Box 2262, c/o The Electrical Review.

YOUNG Electrical Engineer for industrial installations. Capable of estimating and designing power and lighting schemes. Directorship offered for investment of £2/3,000.—Box 2489, c/o The Electrical Review.

YOUNG man as Electrical Engineer's Mate. One willing to learn, for factory in N.E. London district. Apply, stating age, experience and wages required.—Box 2593, c/o The Electrical Review.

APPOINTMENTS FILLED

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A Buyer with 20 years' experience electrical, mechanical and radio components and materials, also machine and small tools, available early August.—Box 6180, c/o The Electrical Review.

ARMATURE Winding Shop Foreman desires change, experience in production and repairs, assembly, testing and redesigning A.C. and D.C. fractional to 500 h.p. —Box 6102, c/o The Electrical Review.

BRANCH Manager desires change to South Midlands. Wholesale, retail and direct sales, office and personnel administration experience. Free by arrangement. Would consider representative for reputable firm.—Box 6090, c/o The Electrical Review.

CONSULTANT/Control. Qualified Cost Accountant, trained in industrial management, practical engineering background, install or reorganise complete systems, control accounts, statistical administrator.—Box 6190, c/o The Electrical Review.

BUYER, aged 30, requires progressive and permanent position. Long experience in buying engineering equipment of all types. Knowledge Far Eastern markets. —Box 6072, c/o The Electrical Review.

CHARTERED Elec. Engr. (32), college and works trained, with ability to handle labour, good administrator, and personality necessary to meet important clients, requires change where these qualities and initiative can be utilised. Business and tech. experience all types electrical and mech. equipment, 6 years' commissioned service. Would also consider investing about £1,500 in going concern or meeting another ambitious engineer with similar capital and ideas, with view partnership.—Box 6192, c/o The Electrical Review.

ELECTRIC Lamp making. Production executive, A.I.I.A., 12 years' experience, all types, including fluorescent discharge, desires change.—Box 6097, c/o The Electrical Review.

ELECTRICAL Engineer, Grad. I.E.E. (25), ex-G.E.C. apprentice, subsequent experience in design, sales and buying, seeks position which requires initiative and carries responsibility; preferably installation and maintenance or marine.—Box 6162, c/o The Electrical Review.

ELECTRICAL Engineer, M.I.E.E., with considerable knowledge of design and manufacture, also sales experience in light current engineering, and having many new lines to introduce, desires contact progressive company with regard to active directorship. Investment £4,000 to £6,000.—Box 6163, c/o The Electrical Review.

ELECTRICAL Engineer (25), 4 yrs.' certificated indentured apprenticeship, 2 yrs. test, fractional h.p. to 25,000 kVA, 2 yrs. sales, Nat. Cert., public school education, requires change, home or abroad.—Box 6126, c/o The Electrical Review.

ELECTRICAL Plant and Installations Engineer with 20 years' experience, including executive work at high level, knowledge of modern electrical machinery, transformers and switchgear, desires permanent appointment England or Dominions. M.I.E.E., A.M.I.Mech.E. —Box 6196, c/o The Electrical Review.

ELECTRICAL & Radio Engineer desires prog. situation, six years' exp. radar, exc. knowledge elec. & radio theory & attendant maths. Stud. M.I.E.E., age 33.—Box 6191, c/o The Electrical Review.

ELEC. Engineer Draughtsman (31), specialist machine tools, installations, plant, needs progressive post. Anything considered. Please advise salary.—Box 6125, c/o The Electrical Review.

ELECTRICAL Foreman, age 40, 20 years' experience in electrical installations, maintenance and handling of labour, seeks progressive post, London area.—Box 6112, c/o The Electrical Review.

EXECUTIVE Engineer, A.M.I.E.E., M.I.Mech.E., A.I.I.A. (33), wide interests and experience, seeks progressive appointment, London-Guildford-Portsmouth area.—Box 6086, c/o The Electrical Review.

EXPERIENCED Buyer and Manager, electrical fittings and appliances, cycle and accessories, desires position on or near South Coast.—Box 6160, c/o The Electrical Review.

FOREMAN Electrician (50), liberty July, long varied experience, control large labour force, interview anywhere. Write—H. A., 9, Dale Road, Crayford, Kent. 6159

GRAD. I.E.E. (22), H.N.C., seeks progressive position; 7 yrs. in power station D.O. Prepared to accept low initial salary provided prospects are good. Willing to go abroad if necessary.—Box 6167, c/o The Electrical Review.

MANCHESTER area. D.F.H. (Hons.), Grad. I.E.E. (27), desires progressive position as Sales or Contracts Engineer or as Technical Assistant to director or contracting firm. First-class training and experience, specialising distribution and switchgear. Ex-major in R.E.M.E. Salary £550.—Box 6134, c/o The Electrical Review.

M.I.E.E., M.I.Mech.E., released from duty with Control Commission Germany, desires administrative, executive or technical post of responsibility. Sound experience in electricity distribution, power stations and planning. Full particulars.—Box 6116, c/o The Electrical Review.

NEWS of openings for Electrical Designer required.—Box 6138, c/o The Electrical Review.

POSITION as Junior Engineer or Trainee required by Graduate I.E.E. (age 23), H.N.C. in electrical engineering, 5-year indentured apprenticeship and 1 year in administrative position.—Box 6168, c/o The Electrical Review.

PRODUCTION Engineer, 25 years' exp. light mechanical and electrical engineering, sound machine shop experience. Modern production methods. Jig and Tool design. Organisation and labour control. Ex. Refs.—Box 6152, c/o The Electrical Review.

REPRESENTATIVE or Demonstrator for manufacturer or wholesaler, Eastern Counties, own car, knowledge of trade.—Box 6176, c/o The Electrical Review.

RESPONSIBLE Executive post sought by engineer, age 29, with university degree and seven years' electrical and mechanical experience, London area. Salary £600. —Box 6156, c/o The Electrical Review.

WORKS Manager, A.M.I.P.E., M.I.E.C.E., with considerable experience, design and manufacture radio, domestic appliances, electrical equipment, light engineering, seeks change of position, W. London area preferred. Min. salary £800.—Box 6157, c/o The Electrical Review.

WORKS Manager (37), seeks position, London area, capable and efficient organiser with 16 years' experience mechanical and electrical engineering. Thoroughly conversant all machine tools, jigs, fixtures. Planning, progress and ratefixing.—Box 6132, c/o The Electrical Review.

AUCTION NOTICES

G. R.

BY ORDER OF THE MINISTER OF SUPPLY

Important Unreserved Two Days' Sale on Tuesday and Wednesday, 29th and 30th July, 1947, commencing at 11 a.m. each day precisely, at

WEST BROMWICH, NR. BIRMINGHAM.

M.O.S. Depot No. 68, J. & J. Siddons Ltd., Howard Street, Hill Top, West Bromwich (off West Bromwich-Wednesbury Road, turn at Hawkes Lane, 7 miles from Birmingham, 1½ miles from Wednesbury),

and

M.O.S. Depot No. 111, Gibsons Pre-Cast Concrete Ltd., Union Road, Greets Green, West Bromwich (adjoining Albion L.M.S. Station, 7 miles from Birmingham, 4 miles from Dudley, and 1 mile from Tipton),

of the

VALUABLE ELECTRICAL, WIRELESS AND FACTORY EQUIPMENT AND STORES

including Aircraft Instruments; Instrument Components and Gauges; Petrol Tanks and large variety of Radio Component parts; Electric Motors and Compressors; Avery Scales and Computing Machines; Motorised Pump and Fan Units and Oil Separators; Electric Cookers and Proving Cupboards; Welding Equipment and Mobile Stackers; Pyrometers; Rope Drum Pulleys; 140 Steel and Wood Trolleys and Industrial Vacuum Cleaners; Steel Cabinets; Meteor 12-cylinder Aero Engine; Galvanised Tanks; Dust Extractors, and other Miscellaneous Aircraft, Wireless and Industrial Equipment.

J. H. LEESON, SON & HACKETT, F.A.I. (established 1846) will sell by auction, without reserve, at the two depots as above.

Viewing, Thursday, Friday and Monday, 24th, 25th and 28th July, from 10 a.m. to 5 p.m. Admission on viewing days and sale days by catalogue only. One catalogue admits two persons.

Catalogues, price 6d. each, from the Auctioneers' Offices, 8, Cherry Street (corner of Cannon Street), Birmingham, 2. Tel. Mid. 0336-7. Please mark envelopes at top left-hand corner "W.B." No catering arrangements. 2582

G. R.

BY ORDER OF THE MINISTER OF SUPPLY

Important Sale without reserve of

611 MOTOR VEHICLES AND TRAILERS

comprising Ambulances, Breakdown Trucks, Cars, Jeeps, Mechanical Horse, Petrol Tankers, Refuellers, Shooting Brakes, Tankers, Tractors, Trailers, Pole Timber and Water Tank Trailers, Tippers, Trucks, Utility Vans, by well-known British and American makers, including Austin, Albion, Bedford, Chevrolet, Crossley, Dodge, Ford, Hillman, Humber, Vauxhall, International, Thornycroft, Standard, Scammell, Commer (also SEVEN MOTOR CYCLES), lying at Ministry of Supply Depot, Duddingston, Edinburgh.

PUMPS and ENGINEERING EQUIPMENT. Nineteen Petrol, Diesel and Steam Pumps by leading makers; Steam Sterilizer; Twenty-five Electric Generator Sets, 2½ to 15 kilowatt; and Two Vertical Steam Boilers, lying at Younger's Brewery, Craigmillar Road, Duddingston.

550 PEDAL CYCLES and 100 TRUCK BODIES, lying at M.O.S. Storage Depot, Caroline Park, Granton.

On view at the different Depots on Tuesday and Wednesday, 15th and 16th July, from 9 a.m. until 5 p.m. each day, and on mornings of sale from 9 a.m. till 10.30 a.m.

LYON & TURNBULL LTD.

will sell by auction as above within the Corn Exchange, Newmarket Road, Edinburgh, 11, on Thursday and Friday, 17th and 18th July, 1947, commencing at Eleven o'clock each day.

Catalogue, price 6d., admits one person only to sale, two persons on view days, obtainable from Lyon & Turnbull Ltd., Auctioneers and Valuators, 51, George Street, Edinburgh. Telephone, Edinburgh 20231 & 20358. Telegrams, "Auction, Edinburgh." 2495

Second Sale.

G. R.

BY ORDER OF THE MINISTER OF SUPPLY

MINISTRY OF SUPPLY DEPOT, FEATHERSTONE
(6 miles from Wolverhampton, Staffordshire)

NOCK & JOSELAND

are instructed to Sell by Auction, without reserve, at the above Depot, on Tuesday, Wednesday and Thursday, 29th, 30th and 31st July, 1947, at 11 a.m. each day, a large quantity of Valuable

INDUSTRIAL ELECTRICAL EQUIPMENT AND PORTABLE POWER TOOLS

including about 3,200 MOTORS, various h.p. and voltages, A.C. and D.C., including geared and flameproof types, and 200 Electric Fan Motors; 262 MOTOR ALTERNATORS, standard A.C. and D.C. voltages; 250 CONTROL GEAR UNITS, motor driven and friction drive; 140 Boosters for voltage control; 120 Electric Flex Shaft Polishers and Grinders; 80 Suds Pumps and Sump Pumps; 570 GENERATORS up to 72 kW; 127 TRANSFORMERS up to 114 kVA; 20 Riveting and Etching Machines; 9 D.C. Spot Welders, 40 kVA, complete with Transformers, Circuit Breakers and Rectifiers, and other Arc Welding Equipment; 6 Static Condensers, 20 kVA; 170 Starters, and a large quantity of small Industrial Switchgear. Also a large quantity of Equipment, including Control Panels, Contactor Panels, Furnace Control Panels, Testing Panels, Frequency Changers, Switchboards, Distribution Boards, Fuse Boards, Rectifier Units, Dynamos and Super-Chargers; Pneumatic Grinder (Holman); 120 Drill Steel Bits; quantity of Copper Strip and Copper Busbar; a large quantity of T.R.S. and P.V.C. Multicore Cable.

On view Tuesday, Wednesday, Thursday, Friday and Monday, 22nd, 23rd, 24th, 25th and 28th July, 1947, between the hours of 10 a.m. and 4 p.m.

Admission to view and sale by catalogue only. Each catalogue will admit two persons on view days and one person on sale days.

Catalogues, 1s. each (post free on receipt of postal order) may be obtained from the Auctioneers, Nock & Joseland, 48, Queen St., Wolverhampton, Staffs (Tel. 20070). 2417

G. R.

BY ORDER OF THE MINISTER OF SUPPLY

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BY Order of the Liquidator, R. C. Sheen, Esq., F.C.A., re G. Godson & Son Ltd. (in voluntary liquidation): Leasehold Manufacturing Premises, Pembroke Works, Nos. 213/215, Kilburn Lane, W.10. Substantially constructed building of three floors, dwelling house, 11 rooms, used as offices; open and covered yard space, paved drive-in. Floor area of factory abt. 11,000 sq. ft., now occupied by M.O.W. Property is held on lease, having an unexpired term of about 36 years, at a rent of £120 per annum. Leopold Farmer & Sons will offer the above to auction at The Mart, 155, Queen Victoria Street, E.C.4, on Wednesday, 30th July, 1947, at 2.30 p.m., unless previously sold. Particulars of—R. C. Sheen, Esq., F.C.A., Messrs. Morton, Moller, Sheen & Co., Chartered Accountants, Moorgate Hall, Moorgate, E.C.2; Herbert Reeves & Co., Solicitors, 39, New Broad Street, E.C.2; and the Auctioneers, 46, Gresham Street, E.C.2. 2406

FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O. 1942 *No.* 958.

CITY OF LONDON ELECTRIC LIGHTING CO. LTD.

For Sale by Tender

TENDERS are invited for the purchase of the following plant which may be inspected on application to the Station Superintendent.

One Parsons 6,000-kW Steam Turbine, coupled by means of reduction gear to two 3,000-kW, 500-volt, D.C. Generators in tandem, also condensing and auxiliary plant. Working steam pressure 160 lbs. per sq. in. and superheated to 200° F.

One complete Rotary Converter installation comprising: three 2,000-kW Reactance controlled G.E.C. Rotary Converters and associated 2,200-kVA Brush Transformers, 11 kV, 3-ph., 50 cycle, A.C., 450-500 volt D.C.; one 2,000-kW Booster controlled G.E.C. Rotary Converter with exciter and associate 2,100-kVA Brush Transformer, 11 kV, 3-ph., 50 cycle, A.C., 450-500 volt D.C., this machine suitable for D.C.—A.C. running; together with 11-kVA Reyrolle and G.E.C. starting and D.C. Switchboard.

Purchaser to be responsible for dismantling and removal of plant from Bankside Power Station, S.E.1. 2607

RUGBY CORPORATION

THE Corporation invite tenders for the purchase and removal of Scrap Cable, L.T. Switchgear, H.T. Switchgear and H.T. Fuse Units.

Details on application to the Borough Electrical Engineer, Electricity Department, 17-18, High Street, Rugby.

Tenders, enclosed in a plain sealed envelope and endorsed "Tender for Electrical Equipment," must reach me not later than Friday, 25th July, 1947.

D. E. BIART,
Town Clerk.

"The Lawn,"
Newbold, Road, Rugby.
4th July, 1947. 2604

BOROUGH OF MORLEY ELECTRICITY DEPT.

FOR disposal, 192 quarterly type and 63 prepayment type, 200-volts, house Service Meters. Particulars on application to the Borough Electrical Engineer, Electricity Works, Morley.

E. V. FINNIGAN, Town Clerk.
5th July, 1947. 2605

A. Cooksley & Co. Ltd. offer large selection of used Electric Motors, D.C. Write—21/25, Tabernacle Street, London, E.C.2 (Monarch 3357/58). 46

A. Electric Motors, A.C.: 1 400 v., 3-ph., 50 c., 10 h.p., 1,450 revs.; 3 ½ h.p., 1,400 revs.; 1 ½ h.p., 1,450 r.; 1 230 v., 50 c., single-ph., capacitor unit, ¾ h.p., 1,440 r.; 1 230 v., 50 c., single-ph., ½ h.p., 1,425 r. —Thomas Somerton, 20-21 High St., Old Hill, Staffs. 6187

A.C. Motors, 1 h.p. to 5 h.p., 3-phase. Immediate delivery.—Engineering Sales & Export Ltd., Abford House, Wilton Road, London, S.W.1. Vic. 5957-8. 2509

A.C. Prepayment Meters, 125 5-amp. 220-volt B.I.C. type G 1s. coin, 8½d. and 10d. per unit; also 150 5-amp. 200/250-volt E.A.C. type E.H.S., bakelite cases, complete with variable tariff coin mechanism, less meter element. Offers to—Borough Electrical Engineer, Exchange Street, Aylesbury. 26'1

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22. Forest Hill 2278-9. 102

A.C./D.C. Motors can be supplied from stock or at short notice.—John Phillips & Co. Electrics, 31, Fortune Green Road, N.W.6. Hampstead 8132. 126

ALTERNATOR Petrol Set, all new and complete, 28 kVA, 400/3/50, 4-wire. Delivery from stock for users only.—Box 6070, c/o The Electrical Review.

ALTERNATOR Sets, Diesel or Petrol, up to 300 kVA, 3 or 2-phase, any voltage. Also D.C. Sets up to 50 kW.—Box 6067, c/o The Electrical Review.

ALTERNATORS, all sizes from 2-120 kVA, for quick delivery. Apply to—The Electroplant Company, Wembley, Middx. 2500

ALTERNATORS. Build your own sets. We have several brand new 10-kVA, 3-ph., 1,500-r.p.m., 400 or 230-v. Alternators in stock, complete with exciters and voltage regulators.—Box 6068, c/o The Electrical Review.

AUTOMATIC Voltage Regulators for alternators, brand new, by Stone or Isenthal.—Box 6149, c/o The Electrical Review.

ALTERNATORS, G.E.C., 5 kVA, 230 v. A.C., 1,500 r.p.m., B/B, with exciter, £47 10s.; ditto, 10 kVA, £77 10s.—Universal Electrical Co., 221, City Road, London, E.C.1. 2629

ALTERNATORS: 1 125-kW belt-driven Alternator by L.D.M., 440/3/50, 750 r.p.m., vee belt pulley supported by outer bearing; 2 15-kW brand new Alternators by E.C.C., 440/3/50, 1,000 r.p.m. (2 available).—B.C.S. (Engineers & Contractors) Ltd., 3, Castle Street, Cardiff. Tel. Cardiff 8512. 2427

AMMETERS, 0-30, 4" dial, A.C., first grade, flush or surface mounting, even scale, new, Govt. surplus, 45s. each, cheap.—Smith & Hammond, 5, Buckingham Street, London, W.C.2. 2541

APPROXIMATELY 70 New and Secondhand D.C. Motors, ranging from ½ to 25 h.p., including English Electric, B.T.H., Laurence Scott, etc., are available.—F. Wrighton & Sons Ltd., Billet Rd. Walthamstow E.17. 6184

ARMOURED Cables, unused, on original drums, C.M.A. 7/.029 Twin P.I.L.C. S.W.A. served overall 440-yd. drums, £130 per drum; also 7/.064, 3-core V.I.R. circular galvd. wire armoured, 350-yd. drums, £175 per drum. Ex stock, drums free.—Smith & Hammond Ltd., 5, Buckingham Street, W.C.2. Tem. 5063. 2542

B. & W. Water Tube Boilers for disposal: Two 50,000 lb. evap., 310 lb. w.p.; one 30,000 lb. evap., 260 lb. w.p.; one 20,000 lb. evap., 175 lb. w.p.; two 16,000 lb. evap., 190 lb. w.p.; one 12,000 lb. evap., 200 lb. w.p.; one 9/10,000 lb. evap., 200 lb. w.p.; also one 5,000-kW Turbo-Alternator. We install complete, including brickwork. Economisers, Pumps, Piping, Valves, Motors in stock. Please send us your enquiries. We can give immediate delivery.—Burford, Taylor & Co. Ltd., Boiler Specialists, Middlesbrough (Tel. Middlesbrough 2622). 32

BATTERY Chargers for home and export, 4 models, 2-6-12 v., 1, 2 or 4 amp. D.C., any mains voltage. Generous trade terms. Write for catalogue.—The Banner Electric Co. Ltd., Hoddesdon, Herts. Tel.: Hoddesdon 2659. 97

BATTERY Chargers, input 230/1/50 or 400/3/50, 36 volts at 50 amps., 1.8 kW.—Box 6093, c/o The Electrical Review.

BELLMAN Hangars for workshops, storage, etc., supplied and erected under licence, 89' 5" clear span, 18' clear height, 175' long. Door openings for full width at each end if required.—Bellman Hangars Ltd., Terminal House, Grosvenor Gardens, London, S.W.1. Sloane 5259. 124

BI-Uni. The New Push-Button Flush-Fitting Domestic Switch. Wholesale enquiries only. Send for details.—Scemco Ltd., Scemco House, 6/7, Soho Street, London, W.1. Tel. Ger. 1461/2/3. 122

BLISTER Hangars, 91' span × 45' long, and other sizes. Steel or asbestos roofing. Suitable for repair shops, factories, storage, etc. Details from—J. Thorn & Sons Ltd., Box 16B, Brampton Road, Bexleyheath, Kent. Phone, Bexleyheath 305. 43

BLOCKS, best quality, polished wood, imitation walnut. All standard sizes in stock at current prices.—British Elec. & Mfg. Co., 25-27, Berners Street, London, W.1. 65

BRITISH Electric Co. (Beco Ltd.) offer 15-kVA, 400/230, 3-phase, 50-cycles, Petrol-driven Alternator Set complete with control panel, etc.—British Electric Co. (Beco Ltd.), 25/29, Lower Rd., Rotherhithe, S.E.16. 148

BRITISH Electric Co. (Beco Ltd.), Electra House, 25/29, Lower Road, Rotherhithe, S.E.16, will be able in 3/4 weeks' time to quote for early delivery of Alternators up to 100 kVA. 114

B.T.A. A comprehensive service is now available for all classes of tools and equipment for the accumulator trade.—B.T.A., 246, Cavendish Road, London, S.W.12. Tel.: Balham 6691/2. 10

BURDETTE & Co. Ltd. stock Reconditioned A.C. and D.C. Motors and Starters equal to new. Day and night service.—Stonhouse St., Clapham, S.W.4. Mac. 4555. 17

CIRCUIT Breakers, 15 amp., 250 v., single-pole, complete with automatic overload cut-out, robust moulded construction, accepted by most supply undertakings as efficient switch fuses if used in conjunction with our distribution boards; Distribution Boards, 5 and 15 amp., 2, 3, 4 or 6-way, D.P. or S.P. and N.P., wood cases, improved design and finish, no permit required; Ekco and Smithlite Fluorescent Fittings, complete, ex stock, large quantities available, carriage paid; Electric Motors, 1-h.p. squirrel cage induction motors (Tilling-Stevens), 400/440/3/50, 930 r.p.m., new; Insulators, suitable for overhead service cables, bakelite, brass inserts, screwed P.O. thread for pin mounting, vertical type with drip groove, 5/8" high, 3/4" dia., large quantities available, sample 2s. per return, discount on quantities; Wood Switch Blocks, 3¼" round and square, 6" × 3" × ¾", 9" × 3" × ¾" and 6" × 6" × 1", white enamelled and walnut finish from 6s. 6d. and 6s. 3d. per doz. respectively. Discount on quantities and for natural finish.—Metropolitan Distribution Ltd., Truro. 2193

CERAMIC Rods suitable for 200-250 v., 750-1,000 w., 9" × 10¼" long, ⅜" dia, 1s. each, lots of 5,000. Sample by request. Sole distributor—Richard Voss, 6, Merton Way, Hillingdon, Middx. 6081

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COMPLETE Diesel Electrical Sets, A.C. and D.C., for industrial and marine purposes. New or reconditioned used sets of U.S. manufacture. Short time of delivery. Some sets available ex stock. Enquiries invited.—Box 2511, c/o The Electrical Review.

COMPLETE with tubes, Fluorescent Fittings with all gear for immediate delivery. Enquiries—John Phillips & Co. (Electrics), 31, Fortune Green Road, W. Hampstead. Phone, Hampstead 8132. 87

CONDENSERS, Paper Block, 100,000 (ex-Govt., new): 8 mfd. 250 v.; 4 mfd. 600 v.; 4 mfd. 800 v.; 2 mfd. 400 v.; 2 mfd. 600 v.; 1 mfd. 800 v., and .5 mfd. 2,000 v. Attractive prices in lots of not less than 100 each item.—R.C. Radio-Electric, 4, Conduit Court, Long Acre, London, W.C.2. Temple Bar 0233/4. 2356

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CROMPTON Alternator, 150 kVA, No. 140780, 2-phase, 50 cycles, 600 r.p.m., 200 volts, S.P.F., with C.C. Generator, No. 140781, 28/55 volts, 37/71 amps., 600 r.p.m., shunt. Also Ruston Proctor Suction Gas Engine, 224 b.h.p.—Box 2565, c/o The Electrical Review.

CROMPTON-Parkinson 5-kW, 200/230-v. D.C. Generators, b/b, 1,500 r.p.m., with coupling, £49 10s. each; Control Panel with ammeter, voltmeter and regulator, £12 10s.—Universal Electrical Co., 221, City Rd., London, E.C.1. 1892

D.C. Motors, 220 v., as new: Two 10 h.p., comp. interpole, 350 revs., ½-hour rating, tot. encl., made in 1943, £40 ea.; One L.D. & C., 2 h.p., 1,425 revs., shunt interpole (1943), £20; One B.T.H., shunt, 200 v., 3 h.p., 1,050 revs., £25; One English Electric, 5 kW, 220 v. D.C., compound interpole Generator, as new, 1,000 revs. (1943), £38.—R. Sykes, 107, Commercial Rd., Southampton. 6188

DESOUTTER ¾" Gun Drill Spares, 200/230 v.; 9 Armatures; 7 Field Coil Units; 2 gross Brushes; 16 Bearings; 5 Fan Blades; 1 75-volt, 25-amp. Cuttings Dynamo, ideal for plant or charging; 2 200/250-volt Portable Motor Blowers, good pressure, complete with rubber nozzles; 1 3-h.p., 1-phase Ingleby Motor, 200/230 v., 50 cycles; 1 Motorised Nibbling Machine, Edwards, up to 12-gauge, 1-phase, 200/230 v.; 1 Gallenkamp Muffle Furnace, complete with muffle size 8" × 6" × 24", 6 kW, ideal for lab. All delivery ex stock.—Mechanical & Electrical Eng'g Co., S-10, Hereford St., Sheffield. Phone 24577. 2557

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DIESEL Generating Sets, 5 and 10 kW, single-phase, and 16 to 200 kW, three-phase.—Box 2372, c/o The Electrical Review.

EARTH-Continuity Conductor Tape, "Portaway" (Regd.) and Patented, for the efficient earthing of all heavy duty electrical equipment. Send for details.—Porter Electrical Products Ltd., 8, Portsdown Road, Leicester. Tel. 78181. 88

ELECTRIC Motors, A.C. We have available a large selection, both new and reconditioned. Inspection invited. Repairs and maintenance given immediate attention. Send particulars of your requirements to—Max Electric Co. Ltd., 190, Thornton Road, Croydon. Thornton Heath 4276. 72

ELECTRIC Motors, A.C. and D.C. We supply all types and sizes of electrical machinery. Slow speed reduction gears can be supplied to customers' requirements with short deliveries. Send your enquiries to—The Electropower Co. Ltd., 3, Retreat Close, Kenton, Middlesex. Wordsworth 4928. 42

ELECTRIC Motors. A.C., 1, 2 and 3-phase Motors; D.C., 230 and 460-volt Motors. State your requirements to—Mayor Smith Ltd., 73, Market St., Birkenhead. Tel. Birkenhead 1350. 2591

ELECTRIC Motors, 1/3 h.p., 3,000 r.p.m., D.C. 110 volts. Also 220 volts. Stock delivery, £7 10s. each.—John Steel, Clyde Mills, Bingley, Yorks. 84

ELECTRIC Motors: 1 Keith Blackman D.C. 460 v., 0.75 amps., 920 r.p.m., winding series, type TE, complete with tachometer; 1 Stewart Turner 1-h.p. Pump, D.C., 460 v., No. 2238E416, GPH2000/1000, Ft. Head, 5/30, complete with automatic starter, mercury float switch and float; 1 Worthington Simpson Salvo Portable Fire and Salvage Gunmetal Pump, size bore 3/3¼", 2,300 r.p.m., No. 5019800, year 1944, with Mawdsley Motor, D.C., compound wound, Machine No. 60R4767, 2,300 r.p.m., 220 v., amps. 30.2, rating-cont., class 1, 7.4 h.p., enclosed drip proof, 1945, complete with Allen West Starter, No. GO.V559A45/85, year 1945, 220 v., 30.3 amps., 7.4 h.p., and spare parts for motor pump and starter. Electric Overhead Travelling Crane: 1 5-ton Electric Overhead Travelling Crane, as new, span 26 ft., hand-operated electric hoist, with hand-operated trevice, with 12½-h.p. Brooks Slipring Motor, 400 v., also controller for 12½-h.p. motor, 400 v., Ref. No. E.4084A-AY284, resistance 12½ h.p., 145 v., 41 amps, Ref. No. 4084A-AY284, Magnet Brake by E. Holme & Co., Moss Lane, Altrincham, size 2, 415 v., 3-phase, 50-cycles, 2-stroke, 33-pull, year of manufacture 1943, 25 ft lift. Bus Bars: 450 Bus Bars, English Elect. Co., in 12 ft. sections, 3-phase and neutral, with 6 tappings per section, of 9/16" copper rod, completely cased in and complete with end connectors, in excellent condition and guaranteed, as new. Electric Starters: 1 Allen West, type SC2, No. 1.52091, 2PHP, 400-440 v., 3-phase, 50 cycles star Delta Starter; 2 do. Direct-On Starters, ¼ h.p., 200-220 v., single-phase, 50 cycles, 2.55 amps., type SCF No. V.395A29; 1 Ellison Starter, 20 amps., 400-440 volts, 50 cycles, No. 342855, oil immersed. Switch Gear and Fuse Boards: 1 Automatic Igranic A.C./D.C. Change-Over Controller, complete with Bus Bar Chamber and Switch Fuses as follows: 1 160-amp. D.P. Switch Fuse; 4 60-amp. do., all mounted on 2" angle iron frame. Conduit Fittings: 200 Galvanised and Black 6 × 3 × 2 Inspection Boxes; 10 6 × 6 × 2½ Inspection Boxes; 150 gross 1½" Female Brass Bushes; 84 Porcelain Bayonet Cap Holders; qty. of rubber and lead covered wire, also bare copper wire. Condensors: 1 12.5 plus 12.5 U.F. Condenser; 8 300-v. U.F. Condenser; 1 300-v., 50 do.; 1 300-v. 60 do. Electric Welder: 1 British Federal Electric Welder, 100 kVA, 50 cycles, 400 v., Machine No. 6079, Transformer No. 4065/6, water cooled. Blowers: 1 Lawrence Scott 2.5-h.p., 400-440-v., 3-phase, 50 cycles, 3.7-amps, 1,425-r.p.m., rating-cont., conned Star-Delta, complete with Starter and Sturtevant Blower; 4 Keith Blackman Blower Exhausters, type 30, No. U.8798, with electric motor, 400 v., 20 amps., 15 h.p., 2,900 r.p.m., 50 cycles, type PT., date 1940; 4 do. Blower Exhausters, type S.4, with electric motor, 400 v., 11 amps., 8 h.p., 2,900 r.p.m., 50 cycles, type SPT No. 5701, 1940. Heating Units; 1 Mather & Platt Air Flow Heating Unit, with 15" Fans, unit size 174, tested pressure hydraulic 300 lbs., heating medium steam safe working pressure 70 lbs., 0.1 h.p., 400-440 v., 50 cycles, 3-phase; 1 do., unit size 128. Reduction Gears: 2 D. Brown & Co. Radicon Reducers, 3000/1. Coal and Ballast Hoppers: 20, as new, Coal and Ballast Hoppers, with conveyors, complete with 5" buckets, size of hopper across top 10 ft. sq., depth of hopper 10 ft. × 16 ft. Tool Boxes and Racks: 6,000 Steel Tool Boxes, sizes 2' 2" × 9" × 9"; 600 variable size Steel Racks and Benches. Renolds Chain: qty. of new Renolds 1½" Pitch Chain and Sprockets. Acetylene and Oxygen Gauges: 10 Acetylene Gauges; 18 Oxygen Gauges. Additional Motors: 8 Lancashire Dynamo Crypto, .68-h.p., 3-phase, 50-cycles, 400-v., 1.7-amps., 700-r.p.m., size 1G. No. 81A01, totally-enclosed, Fan Motor; 1 Motor Alternator, 2.5 kW, at unity power, 220 v., D.C., 18 amps., 3,000 r.p.m., 230 v., 1-phase, 11 amps., 50 cycles, weight 450 lbs., fitted with ball races; 1 do. 3 kW, at 0.8 power factor, 220 v., D.C., 18 amps., 3,000 r.p.m., 230 v., 3-phase, 7.53 amps., 50-cycles, weight 450 lbs., fitted with ball races. Pumps: 2 2½" Centrifugal Pumps. Pulleys and Plummer Blocks: 4 40", 4-groove, 2¾" Spoke Pulleys; 4 2", G.M. Plummer Blocks; 26 1¼" do. Gas Furnaces: 5 Brayshaw Furnaces, year of manufacture 1940, Ref. No. 9.6962; 2 Incandescent Heat Co. Furnaces, square type. Degreasing Plant: 1 Degreasing Plant. Steel Plate: 30 tons 18G. Steel Plate. Gas Producing Plants: 2 5-therm Gas Producing Plants. Transformers: 22 low voltage Transformers, 230 v., single-phase, 50 cycles, input, output 12 v., 100 watt.—C. J. Rice, 137, Mayplace Road West, Bexley Heath. 55

ELECTRIC Motors, 440 v., 3-ph., 50 cycles, 30 h.p., 500 r.p.m.; 50 h.p., 575 r.p.m.; 90 h.p., 575 r.p.m., slipring; £70, £110, £160.—Norman E. Potts (B'ham) Ltd., 130, Moseley Road, Camp Hill, Birmingham, 12. 2309

ELECTRIC Motors: 3 h.p., 400/40/3/50, speeds 2,800, 1,400, 960, 710; 3 h.p., 210/420/3/50, speed 950; 3/2 1/4 h.p., 400/40/3/50, change-pole, 4-speed, 1,460/970/720/460; 2½ h.p., 400/40/3/50, speeds 2,800, 1,400, 710; 2 h.p., 400/40/3/50, speeds 2,800, 1,400, 960, 710; 2 h.p., 400/40/3/50, change-pole, 2-speed, 1,460/460; 2 h.p., 400/40/3/50, change-pole, 4-speed, 1,440/950/710/470; 2/1½ h.p., 400/40/3/50, change-pole, 2-speed 1,500/1,000; 2/1 h.p., 400/40/3/50, change-pole, 2-speed, 1,425/705; 1½/1 h.p., 400/40/3/50, change-pole, 4-speed, 1,460/970/720/460; 1½ h.p., 400/40/3/50, speed 1,390; 1 h.p., 400/40/3/50, speeds 2,800, 1,400, 960, 728; ½ h.p., 110 volt, 1,725 r.p.m., shunt, T.E.—Burdette & Co. Ltd., Stonhouse Street, London, S.W.4. Tel. No. Macaulay 4555. 2494

ELECTRIC Motors and Dynamos. We hold one of the largest stocks of new and secondhand motors. Secondhand machines are thoroughly overhauled. Inspection and tests can be made at our works. For sale or hire. Send your enquiries to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Phone, 5512-3 Clerkenwell). 13

ELECTRIC Welding Plant, Engine and Electric, A.C. driven, 300 amps. output, complete with weather-proof covers.—Box 34, c/o The Electrical Review.

ELECTRICAL Accessories, including Plugs, Sockets, Switches, Adaptors, etc., and "Becantee" Bakelite Festoon Striplighting Lampholders, which are available for immediate delivery. Catalogue and price lists sent on receipt of your enquiry.—The Beeantee Illuminations (London) Ltd., 69, Upper Street, Islington, London, N.1. Telephone, Canonbury 4555 and 1034. 71

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FACTORY Sheds, 100 ft. × 30 ft. × 10 ft. Steel and asbestos construction. Delivered and erected. Full details from—J. Thorn & Sons Ltd., Box 111, Brampton Road, Bexleyheath, Kent. Phone, Bexleyheath 305. 136

FANS, 15 v. D.C., G.E.C.—Box 6095, c/o The Electrical Review.

FIREBARS, pencil rod type, 12", and others, wound or unwound, available large quantities.—Ceramic Components, 92, High St., Hampton Hill, Middx. 6171

FLEXIBLE-drive Electric Motors, 3-speed countershafts, ¼-2 h.p., 440 v., 3-ph., well-known maker; Ventilating Fans, 10", brand new, 230 v. A.C., wall fixing. Details and prices of both above from—Carbot Ltd., 201, Long Lane, S.E.1. 2513

FLUORESCENT Chokes, 80 watt. Low noise level, for satisfied users; long life, for low replacement costs; characteristics matched with lamp, for rated lamp life and light output. Prompt deliveries.—Micramatic Ltd., Meico Works, Congleton, Cheshire. 73

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MOTOR Converters, 1,500 and 2,000 kW, manufactured by G.E.C., Bruce Peebles and Brush Electric, A.C. input 10,750 v., 3-phase, 50 cycles, D.C. output 440 to 585 v., 500 revs., complete with starting panels, resistances, field rheostats, etc.—John Cashmore Ltd., Eagle Works, Great Bridge, Staffs. Tel. Tipton 1101/3. 95

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PHONE 98 Staines. 25-kW Mirrlees Diesel Set, 110 v. D.C.; 10-kW Ruston Diesel Set, 110 v. D.C.; 34-kW Browett Steam Set, 220 v. D.C.; Rectangular Steel Tank, 30′ × 9′ × 5″; Fuel Oil Tank, 45′ long × 6′ dia.; Weir Feed Pump, 10¾″ × 8″ × 22″; Feed Water Heater, 10′ × 2′ 6″ dia.—Harry H. Gardam & Co. Ltd., Staines. 60

PILOT Transformer Converter, 200/230 v. A.C., s/ph., 50-c. input, 400/440-v., 3-ph., 50-c. output, to carry 25 h.p., with control gear, £188.—Universal Electrical, 221, City Road, London, E.C.1. 2281

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MOTOR Generator, modern machine, 3-phase, 400-volt, 50-cycles motor, coupled direct to D.C. generator, output 5 kW, 440 volts.—George Humphries & Co. Ltd., 71, Whitfield Street, London, W.1. 6183

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